REPORT RESUMES

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THE ILLINOIS TELEVISION PROJECT FOR THE GIFTED, A COMBINED EXPERIMENTAL AND DEMONSTRATION PROJECT TO TEST AND DEMONSTRATE TELEVISED ENRICHMENT UNITS FOR STUDENTS AT UPPER ELEMENTARY LEVELS. FINAL REPORT.

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ILLINOIS UNIV., URBANA, OFFICE OF INSTR. RESOURCES
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THE RESULTS OF AN EXPERIMENTAL PROJECT USING THREE SERIES OF ENRICHMENT UNITS ARE SUMMARIZED IN THIS REPORT. EACH PROJECT CONSISTED OF 12 HALF-HOUR VIDEOTAPE PRESENTATIONS IN ASTRONOMY, MATHEMATICS, AND GEOGRAPHY. THE LESSONS WERE PRESENTED TO 570 GIFTED (AVERAGE IQ OF 124) FIFTH AND SIXTH GRADE STUDENTS WHO REPRESENTED THE UPPER 25 PERCENT OF THE TOTAL FIFTH AND SIXTH GRADE POPULATION. CONTROL GROUPS WERE ESTABLISHED BY HAVING THE CHILDREN VIEW TWO OF THE THREE SERIES. WORK IN THE PROJECT WAS VOLUNTARY, AND NO GRADES WERE GIVEN. THE PROGRAM OPERATED COMPLETELY APART FROM CLASSROOM CONTEXT AND DID NOT INVOLVE TEACHERS IN ANY WAY. VIEWERS AND NONVIEWERS WERE COMPARED IN TEST PERFORMANCE REACTION, ATTITUDE TOWARD SUBJECT MATTER, AND OTHER FACTORS. RESULTS INDICATED THAT SIGNIFICANT (.001 LEVEL OF CONFIDENCE) IMPROVEMENT IN LEARNED CONTEXT OCCURRED FOR ALL THREE COURSES. PUPILS REPORTED LIKING THE LESSONS, BUT LITTLE OR NO DIFFERENCE IN ATTITUDE OR OVERT BEHAVIOR WAS FOUND BETWEEN VIEWERS AND NONVIEWERS. FEW STUDENTS REPORTED ANY DIFFICULTY IN KEEPING UP WITH REGULAR CLASSROOM WORK. THE CREATIVITY APTITUDE OF THE STUDENT HAS LITTLE BEARING ON SUCCESS IN (ACHIEVEMENT) OR ATTITUDE TOWARD THE TELECASTS. INDEPENDENT STUDY ABILITY WAS RELATED TO SUCCESS IN THE COURSE. RECOMMENDATIONS ARE MADE ON SELECTION OF STUDENTS WHO WILL VIEW AND METHODS OF USING THE TELECASTS. SAMPLE TESTS, QUESTIONNAIRES, AND INFORMATION ON RELATED STUDIES ARE INCLUDED. A BIBLIOGRAPHY LISTS 29 ITEMS. (RM)

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FINAL REPORT

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The Illinois Television Project for the Gifted

THE ILLINOIS TELEVISION PROJECT FOR THE GIFTED

FINAL REPORT

(A Combined Experimental and Demonstration Project
to Test and Demonstrate Televised Enrichment Units
for Students at Upper Elementary Levels)

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with

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State of Illinois Experimental and Demonstration Project
Senate Bill 749, 73rd General Assembly
Project Number E14

Office of Instructional Resources
University of Illinois
Urbana, Illinois

In cooperation with

The Central Illinois Instructional Television Association

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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ABSTRACT

THE ILLINOIS TELEVISION PROJECT FOR THE GIFTED: FINAL REPORT

Purpose

Under a grant received in December, 1963, from the Department of Program Development for Gifted Children in the Office of the Superintendent of Public Instruction, an experimental and demonstration project (E14) known as the Illinois Television Project for the Gifted was initiated. The objective of the Project was to evaluate and demonstrate whether television lessons could be produced and used effectively by the schools to provide an enriched curriculum for gifted students without heavy demands of time and money being placed upon each school.

Three hypotheses were to be tested:

1. Students viewing the lessons would score higher on achievement tests in the subject area than students not viewing the lessons.
2. Students viewing the lessons would not fall behind in their regular classwork during the period of the telecasts.
3. Students viewing the lessons would exhibit more favorable attitudes and motivational behavior toward the subject areas of the telecasts than students not viewing the lessons.

Procedures

Three series of twelve half-hour enrichment units, with accompanying student workbooks, were developed, produced on videotape, and experimentally tested on gifted fifth and sixth grade students. The lesson series were in the areas of science (astronomy), mathematics, and geography. The content was developed by staff and assistants from the Elementary-School Science Project, the University of Illinois Committee on School Mathematics, and the Department of Geography, all at the University of Illinois. Consultants from the public schools and the University of Illinois advised on the content and presentation of each series, and in some cases material was tried out on students before the final taping. All three courses actively involve the student during and after the telecast.

In order to reduce the personnel demand upon the schools, the lessons were designed to be used as part of an independent study program for gifted students. Work in the Project Books and other outside activities and reading were done by the students on a voluntary basis. No grades were given for work done in connection with the lessons, and no "assignments" were made. The classroom teachers, in many cases, did not even see the telecasts, and in any case no classroom follow up was made by the teacher.

Some 570 students in 19 Central Illinois schools were selected to view the lessons and serve as experimental subjects for evaluation during the 1964-65 school year. Students were selected to view if they passed two out of three of the following qualifications: ability test scores indicating IQ above 125, achievement test scores two years ahead of their age group, or recommendations from the classroom teacher. The sample selected constituted about 25% of the total fifth and sixth grade population in the experimental schools. An additional 1000 students in 30 other schools also viewed the lessons.

Each student in the experimental sample viewed two of the series and served as a control subject on the third series. About half of the experimental schools had had some limited program for their more able students prior to the Project, and about half of the schools had had some regular experience previously with instructional television. In each school students from several classrooms were pooled together to watch the lessons. Tests and questionnaires were administered to the viewing and non-viewing experimental subjects before and after each series. The results were analyzed during the spring and summer of 1965, with separate analyses being made for the total sample and for a subsample of the upper 18% of the experimental students.

Results

Learning occurred during all three of the televised enrichment units, with students viewing each series of lessons scoring significantly higher on the achievement test than the control non-viewing group. For the total sample, viewing the lessons improved test scores 30% in astronomy, 35% in mathematics, and 12% in geography. For the high ability subsample, the improvements were 31% for astronomy, 16% for mathematics, and 18% for geography.

Teachers reported that only a few students were unable to handle the additional work successfully. Only about 5% of the students reported that they were having quite a bit of difficulty in keeping up with their regular classwork during the telecast period.

Out of thirteen basic attitude criteria, the Astronomy viewing group was significantly more favorable on only two criteria; the Mathematics viewing group was significantly less favorable on three criteria; and the Geography viewing group was significantly more favorable on five criteria. For the high ability subsample only one of the thirteen criteria showed significant differences for the Astronomy and Geography series (viewers more favorable), and no significant differences occurred for the Mathematics series. Other differences were not significant and inconsistent in direction.

Before and after comparisons of evaluations for each series indicated a slight negative shift for viewers during the Astronomy and Mathematics series, and a slight positive shift in attitude during the Geography series.

The lessons themselves were favorably reacted to by the viewing students. Some 65% said they liked the lessons and only about 15% of the viewers said they disliked the lessons. Liking of the lessons was not significantly related to achievement nor to ability. One-fifth to two-thirds of the students did all of the activities suggested, depending on the course, and two-thirds to all of the students did at least some of the suggested activities in each series. There were significant relationships between working in the Project Books and both interest in the course and student ability level.

Both the total sample and the high ability subsample ranked Astronomy as most interesting and most difficult, Mathematics second, and Geography third.

There was a high rate of parent and public interest in the broadcasts, with 80% of the Astronomy students and 65% of the Mathematics students reporting that their parents watched the lessons at home.

Conclusions

When used as part of a limited independent study program utilizing enrichment television lessons, the use of the three instructional television series of the Illinois Television Project for the Gifted will result in significant learning and will be favorably received by educators and by students, but only a few students will show favorable shifts in basic attitudes and motivations.

The initiation of an independent study program for elementary school students should be carefully planned. The criteria for selecting students to view an instructional television series will depend upon the intended use of the lessons in the school. When television lessons are used as part of an independent study program extra care must be taken in selecting students, and criteria of capability at self-directed study as well as academic ability should be used.

CHAPTER 1

Introduction and Background of Study

Introduction

On December 7, 1963, Governor Otto Kerner gave final approval to Senate Bill 749, which provided funds for the establishment of the Illinois Plan for Program Development for Gifted Children. The Illinois Plan established in that year provided for five general categories of activities aimed toward the development of the full potential of the state's gifted children: (1) reimbursement for services and materials used by schools in special programs for the gifted; (2) the establishment of centers for the demonstration of special programs for gifted students; (3) the establishment of a State Department of Program Development for Gifted Children as a special division of the Office of the Superintendent of Public Instruction; (4) the establishment of special training programs for educators wishing to specialize in the education or counseling of gifted children; and (5) experimental programs in the education of gifted students.

Under this final provision of the Act, a number of experimental projects were undertaken in the general field of educating the gifted. This report is concerned with one of these experiments: "A Combination Experimental and Demonstration Project to Test and Demonstrate Televised Enrichment Units for Students at Upper Elementary Levels." This title was subsequently shortened for convenience to "The Illinois Television Project for the Gifted." Preliminary work on the project was begun in December 1963, and a more complete chronology will be presented in a later section of this chapter.[1]

Objectives

The Illinois Television Project for the Gifted was concerned primarily with determining the feasibility of providing enrichment learning opportunities for gifted fifth and sixth grade students through the medium of television. The objective of the Project was to demonstrate that television lessons can be produced and used effectively by the schools to provide an enriched curriculum for gifted students without heavy demands of time and money being placed upon each school.

A corollary objective of the Project was to demonstrate the use of television by a selected group of students as a medium for independent study in the elementary school. No grades were given to the students for performance on tests or in the Project Books, and no outside work or reading was assigned by classroom teachers.

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[1] The Illinois Television Project for the Gifted was conceived and initiated by Biloine W. Young, Executive Secretary of the Central Illinois Instructional Television Association, and a staff member of the University of Illinois Office of Instructional Resources and College of Education. Mrs. Young directed the Project until June 1964, when she moved with her family to Gallup, New Mexico.

Three series of twelve half-hour enrichment units, with accompanying student workbooks, were developed, produced, and experimentally tested. The lesson series were in the areas of science (astronomy), mathematics, and geography. Basically, the experiment was designed (1) to measure the amount of learning in the subject matter areas presented; (2) to determine whether students viewing the lessons were stimulated to further independent activity in the subject areas presented; and (3) to determine how much, if any, the students' achievement in their regular school work would be affected by this addition to their curriculum. Measurements were made by means of pre- and post-tests administered before and after students had viewed each series, and all measurements were controlled against a group of non-viewing gifted students.

Justification

So many excellent studies on the special educational needs of gifted children have been carried out in recent years that further justification of the necessity for meeting those needs would be superfluous in the context of this report. It may, however, be useful to summarize these needs as they have been outlined by experts in the field, as well as to recount some of the difficulties and obstacles encountered in implementing special educational programs for the gifted. The authors will then attempt to relate these needs and the difficulties faced in meeting them in a normal classroom situation to the possibilities inherent in television as one of the newer educational media.

The necessity for an enriched educational experience for gifted students is emphasized by Sumption and Luecking:

> [Gifted students] are able easily to complete the basic work expected in the general curriculum in one-half and sometimes one-third of the school day, so there must be more work for them to do, more learning experiences for them to have ... in order that they make the best use of their time, develop intellectually as they are able, learn good study habits, and form good attitudes toward learning and living.[1]

Several definitions of educational enrichment have been put forward by educators. Perhaps one of the most satisfactory definitions is that of Gallagher, who defines enrichment as "the type of activity devoted to the further development of the particular intellectual skills and talents of the gifted child."[1]

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[1] M. R. Sumption and Evelyn Luecking, Education of the Gifted (New York: Ronald Press, 1960), p. 351.

What are the unique qualities of mind possessed by gifted students? Lessinger has defined these qualities as "the possession of a high level of abstraction, generalization, and need for knowledge."[2] In an examination of the literature on gifted children Gallagher found a general concensus that the the outstanding strengths of the gifted child are centered in the following abilities:[3]

1. The association and interrelation of concepts.
2. The critical evaluation of facts and arguments.
3. The creation of new ideas and origination of new lines of thought.
4. The ability to reason complex problems through.
5. The ability to understand other situations, other times, and other people; to be less bound by one's own peculiar environmental settings.

An examination of the literature also reveals a general agreement by experts in this area that an enrichment program for the gifted should not merely consist of additional work related to the regular curriculum, but should include new curriculum materials especially designed to stimulate and challenge the special intellectual capacities of gifted children. In a discussion of course content and method for gifted children, the editors of the NEA Bulletin Research for the Academically Talented Student point out that

> The academically talented child is distinguished from other youngsters by the nature and scope of his intellectual ability. Unless this difference has some functional connection with differences in learning, there is no justification for doing anything with academically talented children that any good classroom teacher would not do with all children. If these differences have functional learning consequences,

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[1] James J. Gallagher, Teaching the Gifted Child (Boston: Allyn & Bacon, Inc., 1964), p. 95.

[2] Leon M. Lessinger, "Enrichment for Gifted Pupils -- Its Nature and Nurture," Exceptional Children, Vol. 30, No. 3 (November, 1963), p. 119.

[3] James J. Gallagher, Analysis of Research on the Education of Gifted Children (Springfield, Ill.: Office of the Superintendent of Public Instruction, Special Study Project for Gifted Children, 1960), p. 20.

> education is shirking its responsibilities unless it adapts curriculum to take advantage of them.[1]

Ideally, an enrichment program for gifted students should include the following: (1) special ability grouping; (2) special curriculum materials, based upon the particular intellectual abilities of gifted children; (3) specially trained teachers, well versed in depth in the subject matter area so that they can help students to find basic concepts and interrelationships; and (4) a consistent program, carried out from year to year throughout the student's school experience, and supervised and coordinated by specially-trained personnel.

Although there appears to be general agreement that curriculum materials for gifted children should emphasize basic concepts, abstractions, and generalization rather than practical applications and memorization of details, a 1954 survey of mathematics curriculum practices for the gifted in secondary schools found that, of the thirty practices detailed on the questionnaire, an emphasis on the "social uses" of mathematics ranked second out of thirty. The most frequently used forms of enrichment in the science curriculum consisted of special reports, extra reading, and helping with demonstrations.[2]

During the years since this survey was completed, excellent new science and mathematics curriculum materials have been developed, but the developers of these materials often stress that special in-service training for teachers utilizing them is important, or even essential.

In a summary comment on existing enrichment programs for gifted elementary-age children, Gallagher has commented that

> There is some suggestion that the goal of "enrichment of gifted children in the regular classroom," while admirable in concept, falls short in actual practice. The classroom teacher has limited time available and more important, lacks knowledge of curriculum enrichment skills and content information that would be necessary to carry out such a program. Most of the programs now in existence have found it necessary to add specially trained personnel with specialized talents and training in order to make such a program effective.[3]

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[1] Kenneth E. Anderson (ed.), Research on the Academically Talented Student (Washington, D.C.: National Educational Association, 1961), p. 65.

[2] Teaching Rapid and Slow Learners in High School (Washington, D.C.: U. S. Department of Health, Education, and Welfare Bulletin 1954, No. 5), pp. 47 ff.

[3] James J. Gallagher, Analysis of Research on the Education of Gifted Children, p. 84.

The difficulties inherent in the development of effective enrichment programs would seem to be multiplied in the small school. Even though special curriculum materials are becoming increasingly available in "packaged" form, the use of such materials would seem to demand homogeneous grouping, frequently impracticable in schools with small enrollment. In addition, the hiring of specially trained teachers or consultants may not be financially justifiable in schools with only a handful of students meeting the criteria for giftedness.

In utilizing television as a means for providing special curriculum materials for the gifted, the Illinois Television Project for the Gifted has sought to explore one of the many possibilities inherent in the use of the newer educational media toward the solution of some of the problems outlined above.

Advantages and Limitations of Televised Enrichment

The utilization of televised instruction to provide enrichment for gifted children has both inherent advantages and disadvantages. Among the possible advantages might be listed the following:

1. Through the medium of television, highly skilled and trained teachers can teach, quite literally, thousands of students each day.

2. In schools where students are not homogeneously grouped and special teachers are not available, a small number of gifted students may leave their regular classrooms to participate in special curriculum programs, while the classroom teacher uses the period of their absence for additional drill and practice on the regular curriculum by lower-ability students.

3. Since materials reproduced on film or videotape can be duplicated and used over wide geographical areas, and their use repeated over time so long as the materials are up to date, television should represent a fairly economical means of providing enrichment learning opportunities for gifted students, particularly when compared with the costs involved in providing such programs individually in smaller schools.[1]

4. With multiple-channel, closed-circuit television facilities, enrichment programs might be tailored to the individual student's particular area of interest. This advantage presupposes, of course, the future development of low-cost videotape recording equipment for both off-the-air recording or tape transfer, as well as for playback, and the development of a wide variety of televised enrichment materials. Such VTR equipment is already being developed and sold. The production of enrichment materials of sufficient quantity and scope would represent few problems beyond the obtaining of financing, and some televised materials already available might be utilized for this purpose.

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[1] Televised instruction might, of course, have similar applications for other special groups, e.g., slow learners.

The inherent limitations of television as a means of providing enrichment should also be mentioned. Among these possible limitations are the following:

1. Desirable teaching patterns for gifted students, such as the eliciting of responses and generalizations by the teacher, can only be simulated by television. While materials can be developed in this way, the developers and the teacher can only hope that the desired responses are actually elicited.

2. The present usage of the medium of television tends to be limited to open circuit. This in turn leads to scheduling problems for televised instructional materials, and, inevitably, to the question of the feasibility of using broadcast time for materials designed for a rather small minority of potential viewers.

3. Considerations of the effective use of television in the classroom almost invariably have placed heavy emphasis on the classroom teacher's active participation in preparation and follow-up activities. If the second of the possible advantages listed above is to be realized, it seems likely that the classroom teacher would not even be viewing the television lesson with the gifted students, and that teacher-guided group discussion or activities would of necessity be limited.

4. Although televised instruction may, of course, be used as a part of a thorough, well organized enrichment program for gifted children, many of the advantages of using televised enrichment materials are posited on the provision of a limited enrichment program in schools without other special provisions for the gifted. There is a real question as to whether a limited program of enrichment can really fulfill the special educational needs of the gifted, which ideally should be met by a thorough revamping of the curriculum.

While some of these limitations are probably insurmountable, some of them can be alleviated. With regard to developing desirable teaching patterns for the gifted (Item 1 above), careful pretesting and revision of televised materials can tend to assure the eliciting of desired responses, while carefully prepared independent study materials can help to lead the student toward independent exploration and thought triggered by the television lesson. The objection that it is not feasible to use valuable broadcast time for materials designed for a minority of students will undoubtedly be ameliorated by the future availability of low-cost playback equipment that can be housed within each school.

With regard to the third objection listed above, that the use of television as the core of an independent study program for gifted children limits its benefit by all but eliminating the important role of the classroom teacher in utilization, one can only agree that students would benefit more from such a program if they had the active support and assistance of face-to-face instruction. Since, however, the purpose of this study was to determine whether television would offer a means of providing enrichment that was both financially and physically feasible in smaller schools, it seemed necessary at least to try to determine experimentally whether or not such instruction would be feasible without the active participation of the classroom teacher. Quite obviously, televised materials developed for use as an independent study project might also, with some adjustments, be used with the more conventional "team teaching" approach to televised instruction when this is possible, and would still offer the advantage of relieving the teacher from part of the burden of direct instruction, preparation of elaborate visual materials, etc.

The fourth objection, whether a limited enrichment program such as the one envisioned in this study can really fulfill the special educational needs of gifted children, particularly with regard to long-range benefit to the child, has not, to the experimenters' knowledge, ever been adequately tested. Until this problem is subjected to rigorous and well-designed experimental scrutiny, experiments such as the Illinois Television Project for the Gifted can only base themselves on the assumption that "some enrichment is better than none." There are a few relevant experiments on the effects of short-term or limited enrichment programs; these will be discussed in the next section of this chapter.

Independent Study

The Illinois Television Project for the Gifted represented one of the few ventures to date in the implementation of an independent study program at the elementary level. One of the reasons that the experimenters used this approach was the expectation that in many non-homogeneously-grouped classes, a few gifted students would be sent out of their regular classrooms to view the televised enrichment units. It seemed quite possible that the students' teacher might not be able to view the lessons with them, and would also be unable to take the time to master the subject matter herself, or to supervise post-telecast discussion and activities.

But other, more positive reasons for introducing independent study for gifted students can be cited. Sumption and Luecking point out that the teacher can act more as a resource person with regard to enrichment activities carried on by her gifted pupils and that such a situation is a desirable part of the learning experience of gifted students:

> Gifted children must have the opportunity to develop responsible self-direction and independence in study; a teacher-dominated learning situation does not supply opportunities for these skills to be taught and learned.[1]

Extensive elements of independent study have been uncommon at the secondary school level and rare in the elementary schools; however, through the development of a variety of new educational approaches, such as discovery learning, inquiry training, and programed learning, student responsibility for his own learning is becoming an increasing part of many educational programs. As this new student-teacher relationship called independent study emerges, Rogge sees four maturational steps developing:[1]

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[1] Sumption and Luecking, op. cit., p. 374.

1. The student assumes responsibility for his own learning, without dependence on the teacher for motivation (grades, exams), by control of the inner self and by internalized motivation.
2. The student assumes responsibility for the selection of new activities the teacher may present.
3. The student assumes responsibility for designing the structure of a new activity.
4. The student assumes responsibility to devise and make his own evaluation of his activities.

The Illinois Television Project for the Gifted necessarily limited itself to the first of these four maturational steps. The role of the students' classroom teacher was visualized to be one primarily of encouragement and support; no assignments were given to the students, who performed all work and activities in connection with the lessons on a voluntary basis; and although examinations were administered in connection with the experimental evaluation of the Project, the students were aware that no grades would be given for their performance in these tests.

Related Research

The fact that children can learn as much, if not more, from a televised presentation as from a live classroom teacher has been well established through numerous experimental studies. Wilbur Schramm reports that out of 393 scientifically-designed and statistically-treated comparisons of televised and classroom teaching, 86 per cent resulted in as much or more learning by television than in conventional classes.[2]

Schramm's analysis of research results also indicates that instructional television has had its greatest acceptance and success when used in grades two through nine.[3] Available comparisons of televised instruction versus classroom instruction also indicate that the three subject matter areas in which televised instruction has compared most favorably with face-to-face classroom instruction are mathematics, science, and social studies.

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[1] William Rogge, "Independent Study," Paper read at meeting of directors of gifted project demonstration centers, Springfield, Illinois, January 8, 1965.

[2] Wilbur Schramm, "What We Know About Learning from Instructional Television," Educational Television: The Next Ten Years, ed. Wilbur Schramm (Stanford University: The Institute for Communication Research, 1962), p. 53.

[3] Ibid., p. 54.

Regarding the suitability of television as a medium of instruction for gifted students, no conclusive evidence is available. Some studies have indicated that high-ability students profit more from televised instruction than slow learners, while others have indicated that the reverse is true. Schramm concludes:

> It may well be, as some recent and unpublished research suggests, that both the brightest and the slowest students may derive some differential benefit from televised teaching -- the former, because they learn rapidly anyway, and television can theoretically offer them a great number and variety of responses to learn; the latter, because television concentrates their attention as the classroom often does not. But it must be admitted that we do not yet understand the relation of mental ability to differential learning from television.[1]

In a five-year study of the use of instructional television, the Washington County, Maryland, schools have found that "... pupils often achieve better -- sometimes much better -- in television classes than in conventional classrooms."[2] Of particular relevance are the evaluations made by the Washington County staff of the televised arithmetic and science lessons.

After one year of daily televised mathematics lessons,

> ... in nine months, fifth grade pupils made almost two years' growth in arithmetic -- from five months below grade level to four months above it. This unusual achievement led to the development of television instruction in arithmetic for all elementary grades by the 1957-58 school year.[3]

After one year of televised arithmetic lessons for grades three through six, the evaluators found that more than one year's growth in achievement occurred in every grade in arithmetic concepts and in every grade but one in problem solving. Evaluations at the end of the five-year experimental period showed that the gains measured during the first year were "maintained and improved upon during the remainder of the project."[4]

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[1] Ibid., pp. 62-63.

[2] Washington County Closed Circuit Television Report (Hagerstown, Maryland: Washington County Board of Education, undated [c. 1962]), p. 47.

[3] Ibid., p. 48.

[4] Ibid., p. 50.

Similarly excellent results in achievement were revealed in evaluations of the Washington County televised science lessons. At the end of the 1957-58 school year, scores on the Stanford Intermediate Science Test administered to sixth grade pupils showed that high ability level pupils (IQ's of 111 to 140) registered an average growth of 15 months in comparison to 12 months' average growth for pupils in conventional classrooms. Even more significant gains were shown by low-ability pupils.[1]

A two-year study in Boston considered ability differences related to a television series in natural history.[2] The study was primarily concerned with variables of use of lesson, use of study guide, teacher training, pupil assignments, and related attitudes as they affected achievement and student attitudes. Some 2,600 children in 90 classes participated.

The essential results were that significant differences occurred in achievement as measured by information and vocabulary tests, but that no significant differences occurred in attitude or in achievement as measured by a scientific reasoning test. Four- and eight-month retention studies showed no further changes. Attitudes toward science and scientists are difficult to change, the researchers concluded.

Follow-up activities were found to be a significant factor, but the amount of time spent in follow-up was less significant than the quality of utilization. Learning was achieved as well when the teachers had only a brief course outline as when they had a comprehensive study guide. When the television lesson was used to initiate a learning sequence in the classroom, individual projects and assignments worked effectively. When the television lesson was used to terminate a learning sequence initiated earlier by the teacher in the classroom, group or class projects and assignments worked more effectively. Workshop training for teachers in science education or in television utilization was unrelated to the criterion measures.

During the course of the year the children grew more realistic in their perception of science and scientists, and less favorable in attitude. While the control group increased their interest in science, the experimental group lost interest slightly. Those highest in initial interest and those highest in ability showed the most interest loss. The lowest ability group gained interest. The more intense the school work related to television series, the greater the loss in interest. Two possible explanations of the observed results were suggested. One, that those already interested in science disliked making it so much a part of their school work. It was making fun into work. The second explanation was that the drop in interest was due to the students being exposed to a more realistic and rigorous view of science.

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[1] Ibid., p. 63.

[2] Cornelia Sheehan, Report of Research on the Integration of Science Teaching by Television into the Elementary School Program (Boston: Boston University, USOE, DHEW Title VII Grant No. 719008.09, 1960); and G. T. Amirian, The Retention by Elementary School Children of Natural Science Material Taught by Television (Boston: Boston University, USOE, DHEW Title VII Grant No. 719114, 1961).

In only one previous study known to the researchers has television been used as a means of enriching the educational experience of gifted students. The State of Maine, under a grant from the National Defense Education Act, conducted a relevant study entitled "Intellectual Stimulation of Gifted Pupils in Small Secondary Schools Through Televised Instruction."[1] In this study, two full-year courses in science and two full-year courses in mathematics were prepared and broadcast by open circuit to gifted high school students throughout the state.

Students participating in the experiment were divided into four groups. One group had the televised instruction without additional assistance beyond the resources of their own schools. A second group of students attended Saturday seminars once a month with other viewing students from near-by schools. A third group had the services of assistant teachers who visited the schools bi-weekly to provide face-to-face instruction to the students. A fourth group had both teacher visits and monthly seminars.

The Maine study concluded that it was possible to present full-year courses by television to gifted secondary students which will desirably affect academically talented students. Students with supplementary assistance performed better in the mathematics course than students with only the resources of their own schools, but there was no significant difference in the amount of learning that took place in the science course between students with supplementary assistance and those without. Student attitudes toward these televised courses were generally negative, a fact which experimenters believed might be explained by the fact that the courses represented additional work-loads to the students over and above a full course of regular studies; however, a follow-up questionnaire sent to participating students after they enrolled in college indicated that 85% of the students responding had found the mathematics course to be a valuable aid in their college work, with only eight students indicating that the course had no value.

Two additional studies may be cited, both of them concerned with relatively short-term effects of limited enrichment programs on the academic achievement of gifted children. One of these was a seminar for able rural youth held weekly during the school year in Lewis County, New York.[2] Twenty-five juniors and seniors from six rural high schools were brought together one afternoon a week for enrichment in literature, music, art, and drama. The report on this activity indicates that seminar members grew in self-expression and in critical thinking, and that an increased number have gone on to college. While this study was evidently not a rigorous one from the experimental point of view, it does indicate some intellectual benefits accrued to the students involved, even though the program was fairly limited and not followed up in the students' regular curriculum.

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[1] Joseph J. Devitt, Intellectual Stimulation of Gifted Students in Small Secondary Schools Through Televised Instruction (Augusta, Maine: State Department of Education, 1961).

[2] G. Morris, "A Stimulating Seminar for Rural Youth," Journal of the National Association of Women Deans and Counselors (October, 1957), pp. 31-34.

Another relevant study was undertaken by Nellie D. Hampton at the State College of Iowa.[1] In this experiment, gifted fifth and sixth grade students were selected from area schools to attend an eight-week special summer session conducted by the college. Sixty children in the experimental group were transported to these special morning classes, which were self-contained curriculum units designed to stimulate the particular intellectual talents of gifted children. Two groups of students, matched for age, sex, IQ, and achievement test level, were used as controls. Students in one of the control groups were notified that they had qualified for the special program, but that they could not be accommodated in it due to enrollment limitations; students in the other control group were not aware that they had qualified until the time of the final achievement testing a year later. Post-tests were administered to all three groups at the end of the following school year, and the experimental group was found to have achieved some significant academic superiorities even though the summer session represented a relatively isolated experience, and employed curriculum materials not directly related to their regular studies, and despite the fact that there was no effort on the part of investigating personnel to maintain or reinforce the summer learnings during the ensuing school year.

Development of the Project

Phase I. Developmental

Work on the Illinois Television Project for the Gifted began in December 1963 with the planning of two of the three series of enrichment lessons to be produced. Planning of the science and mathematics series went on concurrently. Production of the lessons for these two series began in January 1964, and was completed by early fall. Preliminary planning of the Geography series began during the summer of 1964, with the lessons being taped in the late fall and early winter of 1964-65. All lessons were produced and videotaped in the studios of the University of Illinois Television Services, with art work and visuals prepared by the television services art staff.[2]

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[1] Nellie D. Hampton, Effects of Special Training on the Achievement and Adjustment of Gifted Children: Third Report. (Cedar Falls: State College of Iowa, 1962).

[2] For a more complete analysis and description of course development and production, see Chapter 2 and Appendix A.

Since the lessons were designed as an independent study project for gifted students, a student workbook, or "Project Book," was developed to accompany each of the three series of lessons. Workbook materials were developed by the television teachers for the mathematics and geography lessons, and by the scriptwriters for the astronomy series. Although the University of Illinois had its own educational television broadcasting facility, WILL-TV, Channel 12, it was at that time a relatively low-power station.[1] The Project staff therefore decided to try to interest a local commercial television channel in carrying the lessons as a public service, in order to maximize the potential viewing audience of students and to insure the inclusion of a sufficient number of schools to participate in the experiment. WCIA-Channel 3, with studios and transmitter in Champaign, agreed to broadcast the lessons as a public service and a mutually agreeable broadcast schedule was agreed upon after consultation with the schools.

During the winter and spring of 1963-64, an intensive publicity program was undertaken by the first Project Director, Biloine Young. Speeches outlining the purposes of the Project and outlining the procedures by which schools could participate in the experiment were delivered at school instructional television conferences, at PTA meetings, and at meetings of other local organizations in the area. In addition, Mrs. Young utilized the newsletter of the Central Illinois Instructional Television Association (based at the University of Illinois) to publicize the Project and to interest schools in participating.

The Project staff visited schools that expressed an interest in the experiment, and by the late spring of 1964 sixteen schools which met the experimental requirements for participation had been enrolled, while a number of other schools had decided to utilize the lessons on a non-experimental basis. Schools participating in the experimental phase of the Project were reimbursed for the purchase of one television receiver. One of the experimental schools later had to drop out due to reception difficulties; this occurred during August 1964. A sixteenth experimental school was later added for the purpose of studying achievement and attitude shifts of a sub-sample of culturally deprived children viewing the lessons.

The Project evaluator, in consultation with the staff of the experimental schools, then selected the fifth and sixth grade students who were to view the lessons. Selection of students was based on their meeting two of the following three criteria for giftedness: (1) an IQ score of 125 or above; (2) an achievement test level of two or more grades above actual grade placement; and (3) recommendation of the student as gifted by his classroom teacher.[2] Lists of the selected students were compiled, and preliminary data and test scores were recorded. The student selection process was completed by the end of the 1963-64 school year.

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[1] At this writing, a grant from the Department of Health, Education, and Welfare has made possible the construction of a new transmitter that will increase the station's broadcast coverage area of WILL-TV to four times its present range.

[2] For detailed description of student selection and of requirements for participating schools, see Chapter 3.

Each participating school also appointed a Project Coordinator to act as a liaison between the school and the Project staff. A small honorarium was paid to each Coordinator, whose duties consisted of assisting in the selection of viewing students, administering tests to the experimental subjects, handling correspondence, distributing workbooks and other materials, and attending Project workshops and evaluation meetings.

Phase II - Experimental

The experimental phase of the Illinois Television Project for the Gifted began in September 1964. All Project Coordinators, principals, and fifth and sixth grade teachers from experimental schools were invited to attend an orientation meeting in Urbana on September 12. Travel expenses to and from the meeting were reimbursed by the Project. At this meeting, attended by approximately 90 educators, the background and purposes of the experiment were explained; course contents described; sample lessons from the Astronomy and Mathematics series were viewed via the University closed-circuit system; and the role and responsibilities of the Project Coordinator and classroom teacher were defined. Also at this meeting, test materials, student workbooks, and Teacher's Guides for the Astronomy series were distributed.

During the week prior to the beginning of the broadcasts, Project Coordinators administered pre-tests to the students selected to view the courses.[1] Orientation of pupils and parents to the purposes of the Project was left to the discretion of each school. In most cases, parents were notified by letter that their child would be participating in the experiment.

Broadcast of the Astronomy lessons began on October 5. Richard Adams, Director of Research and Education for WCIA-Channel 3, acted as the station's liaison with the Project staff, and a cordial working relationship with the station was maintained throughout the broadcast period.

Lessons were broadcast from 9:30 to 10:00 a.m. on Mondays and Thursdays. A two-week interval for testing followed at the conclusion of each series before broadcast of the next series began.[2] Students from each experimental school viewed two of the series and acted as a control group for the third series, with the same pre- and post-tests being administered to both experimental and control groups.

At the midway point in the broadcast of the Mathematics series, Project Coordinators met with the Project staff in Urbana for an informal evaluation of the Astronomy series. This meeting was recorded on audio tape, and comments and suggestions from the Coordinators resulted in guidelines for revision of the Astronomy Project Book (student workbook).

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[1] For a description of the evaluation instruments used, see Chapter 3 of this report.

[2] The reader is referred to Appendix B for the broadcast and testing schedule for all three series.

Suggestions from the Coordinators regarding presentation of lessons were helpful in the development of the Geography series then in production. Some of these suggestions included slower pacing of lesson content, and more precise explanations of work in the Project Books. It was generally felt that students enjoyed most the lessons where they were asked to work along with the television teacher during the televised lesson. Some students reportedly had difficulty in learning to draw and measure angles (an important mathematical base for understanding of the Astronomy lessons), and it was decided to add an optional supplementary lesson to the Astronomy series before finally releasing the series for general use.

Some adverse reaction was expressed to the use of the word "gifted" in contexts where the students would become aware of it. Since the lessons were also being used in non-controlled situations by students not qualified as "gifted," the decision was made by the Project staff to remove the Project title from future editions of student Project Books, and not to use the Project title during the station announcement preceding each lesson.

During the broadcast phase of the Project, the Project staff visited the experimental schools, watching the students view the lesson, holding brief discussions with students following the telecasts, and talking with teachers, principals, and Project Coordinators. A variety of viewing conditions were found: in schools with two fifth and two sixth grade sections, the most common practice was for viewing students in each grade to go to one classroom, while non-viewing students took their places in the other classroom for review and additional drill on regular subjects. In other schools, all viewing students went to one room to view the lessons. In this case, the Project Coordinator generally supervised the viewing students, though in some cases students viewed the lessons without supervision.

Work in the Project Books and other outside activities and reading were done by students on a voluntary basis. No grades were given for work done in connection with the lessons, and no "assignments" were made. Since in most cases classroom teachers were not viewing the lessons with the students and therefore presumably had no knowledge of the lessons' contents, students seemed to accept the fact quite readily that their classroom teachers did not actively assist them in their follow-up activities. In cases where the classroom teacher did view the lessons with her students, an artificial situation arose in which the teacher had to withhold help from students, even when she could see that they needed help. This situation, ideally, should not have occurred and indeed probably would not in future use of the lessons, but it did occasion some understandable distress on the part of the teachers in these situations.

As previously mentioned, a number of other schools which were not participating in the experiment also utilized the lessons. Including students in the experimental schools, 723 students in twenty-three schools viewed the Astronomy lessons; 933 students in twenty-three schools viewed the Mathematics lessons; and 1,193 students in thirty schools viewed the Geography lessons. A questionnaire sent to non-experimental viewing schools at the conclusion of the Astronomy broadcasts showed that of the seven schools responding, all followed conditions similar to those employed in experimental schools.

Phase III - Demonstration

Although the demonstration centers for the State Department of Program Development for Gifted Children are of an "on-going" nature with visitors coming in to observe in classrooms carrying on special programs, the Project staff felt that this procedure was not feasible in connection with the Illinois Television Project for the Gifted. Since this was an independent study program, there was actually little to demonstrate beyond the lessons themselves, and these could be viewed at any locality within broadcasting range of WCIA. The Project Director also felt that too many classroom visitors might be prejudicial to the experimental results, since visits might provide a form of motivation to students which would not normally be present during an independent study program carried out under non-experimental conditions.

Consequently, after consultation with Dr. William Rogge, Director of Demonstration Centers for the Department of Program Development for Gifted Children, the Project staff decided to hold two demonstration conferences in areas where there were currently no existing state-supported programs for gifted children, with a third conference devoted generally to programs for gifted children to be held on the University of Illinois campus.

The first of these conferences was held at Gilman High School, Gilman, Illinois, on April 28. James Davis, Superintendent of the Gilman Schools, and Brooks Courtright, County Superintendent, Iroquois County, cooperated in the arrangements for the conference. The conference was announced in area newspapers and in the CIITA Newsletter, with special individual invitations being mailed to each school in Iroquois County and in four surrounding counties. Registration records show that 23 educators attended, the majority of them superintendents or principals. The program consisted of a discussion of the Illinois Television Project for the Gifted; the playback of a lesson tape from the Astronomy series, during which students from a local grade school worked along on sample Project Book pages; a discussion with these students of their reaction to the lesson and to the idea of independent study; a general discussion of special programs for gifted students being carried out in the State of Illinois; and an explanation of how schools might establish such programs in their own schools. Mr. Roger Marcum of the Urbana Public Schools was present to lead this discussion.[1]

The second demonstration-conference was held at the Illini Union on May 15. A general announcement was sent to all schools in the East Central Illinois area in March, while a second announcement accompanied by an agenda and registration forms was mailed to the same schools in late April. The meeting was also announced in area newspapers. The day preceding the conference, May 14, was designated a special visitation day to area schools conducting demonstration programs under the Illinois Plan for the Gifted: North Ridge Junior High School, Danville; Champaign Community Unit 4 Schools; Lakeview High School, Decatur; and Urbana Community School District 116. Attendance at the May 15 conference was 31, and those attending were primarily educators from schools already carrying on special programs for gifted students.

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[1] For copies of the agendas for the three demonstration-conferences, see Appendix C.

A third demonstration-conference was held in McEndree School, Flora, on May 20, and followed a format similar to that of the first conference. Invitations were mailed to schools in a five-county area surrounding Clay County and the conference was announced in area newspapers. Mr. Floyd Henson of the Flora Public Schools cooperated with the Project staff in arrangements for this confernece. Estimated attendance at this meeting was 65.

Although it was not officially a part of the demonstration phase of the Project, the Astronomy series was re-broadcast by WCIA-Channel 3 beginning on April 5, 1965. Approximately 600 students in seventeen schools viewed this re-broadcast, including students from some of the experimental schools who were part of the control group during the initial broadcast, and therefore had not viewed this series before.

The Project staff also gave several talks on the purposes of the Illinois Television Project for the Gifted at State and area ITV meetings, Parent-Teachers' Associations, and at meetings of educators on the University of Illinois Campus. Evaluation results available at the date of these talks were discussed, as well as future availability of the lessons for school use.

Evaluation of the test results went on concurrently with the demonstration phase of the Project, and was completed during the summer of 1965. During this same period, Project Books and Teacher's Guides were revised; the final report was written; arrangements were completed for future distribution of the television lessons and Project Books; and a supplementary Astronomy lesson (#1A) was produced and videotaped.

CHAPTER 2

Development of the Lessons

In preliminary planning of the Illinois Television Project for the Gifted, the decision was made to develop three relatively brief series of enrichment lessons rather than one longer series. The Project staff felt that generalizations made about the possibility of presenting televised enrichment materials successfully would have greater validity if a variety of subject areas were presented, since student attitude and achievement in any one series might be significantly affected by such things as a favorable or unfavorable reaction to the personality of the television teacher, or previous interest in a given subject matter area.

The final choice of science, mathematics, and social studies as the three subject matter areas to be presented in the television lessons was made for several reasons: (1) it was felt that typical school curricula in these areas were not providing a sufficient challenge to the special abilities of gifted students; (2) previous research studies indicated that these subjects seem to relate themselves well to a televised presentation; and (3) in two of these areas, science and mathematics, nationally-recognized curriculum development projects were already underway at the University of Illinois, and it was hoped that staff members from these projects might be interested in participating in the television project. There was also found to be considerable interest in the University of Illinois Department of Geography in the possibilities for a televised course at the elementary level.

Astronomy

Following discussions with Professor J. Myron Atkin and Professor Stanley P. Wyatt, Co-Directors of the University of Illinois Elementary-School Science Project, permission was received to use materials from the first three books of the Science Project curriculum series as the basis for the development of a series of twelve half-hour televised lessons in astronomy.

While it is not within the scope of this report to discuss in detail the development of the original science curriculum materials, a brief summary of the purposes and content of the Elementary-School Science Project curriculum materials may be helpful.[1] The ESSP materials were developed by a team of astronomers, science education specialists, and teachers, and tested in over 350 classrooms. The materials were evaluated through teacher reports, a program of classroom visitation by members of the Elementary-School Science Project staff, and from written tests administered to the children. Curriculum materials were then revised in accordance with the findings from these evaluative procedures.

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[1] For a more complete description and analysis of the University of Illinois Elementary-School Science Project, the reader is referred to the following sources: J. M. Atkin, "The University of Illinois Elementary School Science Project," Elementary School Science Bulletin No. 66 (1961); S. P. Wyatt, Jr., "University of Illinois Elementary School Science Project," Science Education News, AAAS Miscellaneous Publication 62-14, 9 (1962); and J. M. Atkin, "University of Illinois Elementary-School Science Project -- 1964," Journal of Research in Science Teaching, Vol. 2 (1964), pp. 328-329.

Astronomy was selected as a field relying on a number of disciplines for its scientific bases, and the approach to astronomy made in these classroom materials is fundamentally that of an adherence to the essential structure of the subject being studied. As Atkin put it,

> A delineation of content is required that reveals a potent hierarchy of conceptual schemes, a few ideas with considerable intellectual mileage that help the learner understand in the most economical manner possible a given discipline as it is perceived by its senior practitioners.[1]

The Elementary-School Science Project staff also agreed to provide released time for one of their staff members, Gail Pierce, in order that she might be the on-camera teacher for the televised astronomy course. Miss Pierce was a Research Associate for the Science Project and her duties had included teaching the curriculum materials in schools throughout the country, visiting classrooms where the materials were being used, and talking with teachers and students who were using the materials. Prior to her association with the Science Project, Miss Pierce had been an elementary teacher in the Urbana Public Schools.

Two writers were also employed to work with the television teacher, the television producer-director, and the Project Director in adapting the original curriculum materials for television. One of these writers was an elementary school science teacher who had also worked with the Elementary-School Science Project, and the other was a specialist in writing for television. Although the more commonly-followed procedure would have been for the on-camera teacher to develop her own television lessons, the pressure of Miss Pierce's other responsibilities precluded this.

The following working arrangement evolved in the development of the scripts for the television lesson: the television teacher, the producer-director, and the writer held a series of script conferences, during which the scope of each lesson was defined, the logical development discussed, and the use of various visual materials considered. Following the conference, the script writer wrote a script and submitted it to the Project Director, who had the script duplicated and distributed to the television teacher, the producer-director, and staff members of the Elementary-School Science Project for approval or suggestions. Since what was involved in this case was primarily a task of adapting previously developed curriculum materials to the medium of television, this system was found to be quite workable.

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[1] J. Myron Atkin, "Some Evaluation Problems in a Course Content Improvement Project," Journal of Research in Science Teaching, Vol. 1 (1963), p. 129.

Several of the scripts were also sent to a specialist on the education of gifted children, and the entire Project staff conferred with her on the suitability of the presentation of materials for gifted children. It would, of course, have been highly desirable to submit all scripts for such criticism, but available specialists in the field on the University of Illinois campus were under heavy pressures of other responsibilities; consequently, the development of the Astronomy materials proceeded without as much criticism and advice from specialists in the education of gifted children as would have been desirable under ideal conditions. While the Project staff was fully cognizant of this, and in every possible case tried to involve such specialists, time pressures prevented the desired amount of involvement in the development of the lessons as they were finally taped.

The Astronomy series was the only one of the three series in which the television lessons were fully scripted.[1] This procedure was found to have several advantages: (1) it allowed for the use of more elaborate visual effects by precluding skipping or jumping on the part of the television teacher; (2) it enabled the television teacher to use a teleprompter, thereby relieving her of the burden of memorization of the lessons; (3) it recorded the verbal and visual materials used in the lesson, so that the workbooks could be checked against the scripts, a quicker and less time-consuming procedure than viewing the tapes; and (4) it allowed for evaluation of presentation of lesson materials by specialists before taping.

After the first three lessons were taped, they were viewed by fifth and sixth grade students from Leal School, Urbana. A brief discussion was held with the students following the preview, and students were asked to complete sample workbook pages and to take a brief test based on the lesson contents. On the basis of these pre-trials, it was decided to cut down on the total materials to be included in the course, and to revise and re-tape the first lesson and part of the third lesson. The first lesson was also shown to a number of educators around the state, and revision of that lesson was based, insofar as possible, on their criticisms.

Although it had been originally decided to include material from the first three books developed by the Elementary-School Science Project in the televised Astronomy series, the results of the pre-trial indicated that it would be wise to limit the number of concepts to be presented, and materials from the first book and part of the second book only were finally used as the basis for the televised lessons.

The first seven lessons are based upon Book 1 of the astronomy curriculum series, Charting the Universe. The approach in this book is not factual and descriptive, but rather conceptual. Students are encouraged to think about the universe as astronomers have thought about it, beginning with the idea of the earth as an island in space, surrounded by immense distances and unreachable objects. They are then asked to consider the question: How have astronomers been able to measure the distances to faraway objects and the sizes of these objects without ever leaving the earth? Students are acquainted with the basic mathematical tools used by astronomers in the indirect measurement of size and distance, and are asked to follow through the solution of problems with famous astronomers of the past. Scale models of the universe are developed and used in the problem of finding actual sizes and distances.

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[1] For a sample script page, see Appendix D.

A similar approach to a different series of problems is offered in Lessons eight through twelve, based on Book 2 of the Elementary-School Science Project, The Universe in Motion. Here the students are asked to observe the motions of celestial bodies from the vantage point of earth, and they are encouraged to work with a gnomon in mastering the basic techniques involved in measuring and recording such motions. Students are at first asked to consider motions of celestial objects from the vantage point of earth considered as the center of the universe. Then the concept of motion models is introduced, and students are asked to experiment with various combinations of relative motions of celestial bodies, including the possibility of the earth itself being in various kinds of motion. Finally, they follow the thinking of astronomers who have contributed to our present view of the universe. The final lesson in the series is concerned with presenting a simplified picture of the universe as astronomers now view it, putting the earth in its proper perspective of a small planet revolving around a medium-sized star which itself is one of a billion stars in one of the universe's galaxies. Unanswered questions about the universe are introduced, and the students are encouraged to continue their exploration of the subject of astronomy.

An emphasis was placed throughout the lessons on actively involving students by providing for overt responses in the form of active participation in visual experiments, and in working on problems with pencil and paper during the televised lessons. Student and teacher evaluations of the lessons following the experimental viewing indicated that this aspect of the series was favorably received, and a check of the workbooks indicated that most students did participate in such activities.

A student workbook, called the Astronomy Project Book, was developed by one of the writers, and was closely coordinated with script development. The Project Book included exercises to be performed by students during the televised lessons, as well as exercises designed to reinforce the concepts of the previous lesson or to prepare students for concepts to be developed in later lessons. Material in the Project Books often repeated instructions for solution of problems or construction of equipment that were presented by the television teacher during the previous lesson. This aspect of the workbooks was felt to be particularly important in an independent study situation where students could not rely upon their classroom teacher for repetition of lesson contents. Some of the more difficult exercises in the Project Book were programed -- i.e., broken down into small sequential steps with alternate answers presented. Students selecting the wrong answer to a problem were given more detailed instructions for solution of the problem.

The Astronomy Project Book was later extensively revised after the experimental viewing.[1] Programing was removed from the books after an examination of the completed workbooks revealed that many students were merely finding the correct answer and recording it without actually having solved the problem correctly. This mis-use of the idea of programing may well have been an indication that students were not yet adjusted to the idea of independent study without overt rewards in the form of grades given for work done. In accordance with suggestions from Project Coordinators, an answer sheet for the teacher was prepared for future use with the series. Students using the lessons as part of an independent study project then might check their answers against the correct ones after presenting evidence to the teacher of having seriously tried to solve the problem.

A Teacher's Guide was also prepared for this series. This Guide contained a list of materials needed by the students during each televised lesson and for follow-up activities; a summary of the contents of each lesson (for non-viewing teachers); and a vocabulary of words, phrases, and proper names introduced during each lesson. The Teacher's Guide also included a copy of the final examination on course materials administered to students during the experimental phase of the Project, and a bibliography of books and materials suggested for outside reading and experimentation.

Results of the experimental viewing of the Astronomy series later brought about a decision on the part of the Project staff to insert a thirteenth lesson, Lesson 1A, after the first lesson before the series was released for future distribution in other localities. Lesson 1A is devoted wholly to practice in the drawing and measuring of angles, an important mathematical base for understanding of future lessons. This additional lesson was developed and written by the television teacher, and a corresponding section was added in the revised versions of the Astronomy Project Book and Teacher's Guide. Lesson 1A represents an opportunity for additional practice of a skill already presented in Lesson 1, and may be omitted by viewing students if the skill has already been sufficiently mastered.

In summary, the development of the Astronomy lessons was primarily a task of adaptation of previously developed curriculum materials to the medium of television. While the materials developed by the University of Illinois Elementary-School Science Project were not developed solely for use by gifted children, the conceptual development and logical organization of the materials seem well adapted for use by such children, and the use of these materials for gifted children is endorsed by Gallagher in Teaching the Gifted Child.[2]

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[1] Sample pages from the Astronomy Project Book will be found in Appendix E.

[2] James J. Gallagher, Teaching the Gifted Child, pp. 130-133.

Although the adaptation of these excellent and well-tested curriculum materials to television presented some difficult problems in pacing and timing, since the logical development of an idea or ideas inevitably conflicted on occasion with the twenty-eight minute lesson segments and with the twelve-lesson format, the astronomy curriculum did lend itself very well in other respects to televised presentation. A wealth of possibilities for visual presentation was inherent in the materials, and agencies such as the National Aeronautics and Space Administration and Lowell Observatory cooperated by lending film clips, slides, and other materials. When one considers the advantages of the medium in presenting a skilled teacher who was well-trained in the rather difficult subject matter, and in the extensive use of visual materials not readily available in the classroom, a television presentation of these materials presents some fairly obvious advantages.

Mathematics

The Mathematics lessons were developed and produced concurrently with the Astronomy lessons. Production of this series was relatively "informal": no scripts were written, and no special visual effects were sought.[1] The course materials were developed and taught by Professor Robert Wirtz with the assistance of Nancy Reuther Wirtz. Professor Wirtz, at the time the lessons were developed, was a visiting member of the University of Illinois College of Education faculty, associated with the University of Illinois Committee on School Mathematics. A former elementary school teacher and mathematics consultant for the Bucks County, Pennsylvania public schools, he is the co-author (with W. W. Sawyer and M. Botel) of the Math Workshop for Children, published by the Encyclopedia Britannica Press in 1962.

Materials contained in the Mathematics enrichment unit were prepared especially for the Illinois Television Project for the Gifted. While the approach to mathematics is related to the general approach to the subject termed the "new mathematics" in that it is based upon a discovery approach to mathematical concepts and formulae, the particular materials developed were unique to this series of lessons.

Professor Wirtz described his approach to the subject in the following words:

> Our purpose in the series of discussions is to give students at least a few glimpses of the creative side of the subject -- where surprises happen, where problems develop that challenge the ability to think, where questions arise that have not yet been solved.
>
> Our method is to get the listener involved with pencil and paper in doing mathematics. One learns little by listening to people talk about the subject;

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[1] For a discussion of lesson production, see Appendix A.

> rather, he learns most while he is at work -- solving problems. By direction and indirection, we urge the students to work along with us and to continue their work independently after the discussion.
>
> Our point of departure is a little-known theorem from geometry -- Pick's theorem. The students will probably never come across it again in the usual courses of study. It is an old theorem, proved by Pick shortly before the end of the last century. The results are surprising to almost everyone. The work is disarmingly simple.
>
> Extension of the development of the theorem leads into some fascinating problems in the theory of number; into simple algebra; into the Pythagorean theorem -- and we terminate the series by suggesting further investigations that, to the best of our knowledge, have never been made before by anyone.[1]

By the end of the series, a student should be able to measure the area of any polygon laid out on a grid. Extension of the original theorem from lines to squares built on lines and square numbers leads the student into problems in number series and short cut mathematics.

Project Book materials were developed by Professor Wirtz. In general, each page of the Project Book corresponds with the materials used by the on-camera teacher during the lessons.[2] The "lecture" method is never employed; the students are asked to work along on the project sheets at their own pace throughout the series, and to continue working for awhile after each lesson.

After the first two lessons were videotaped, they were sent out via closed circuit to a local elementary school. Fifth and sixth grade students viewed the lessons, filled out questionnaire forms, and completed sample workbook pages. The first lesson was also previewed by a consultant in the education of gifted children. Written recommendations, summarizing the findings of both the pre-trial and the suggestions of the consultant and Project staff, were then sent to the television teacher.

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[1] Quoted from a description of the purpose of the mathematics series prepared by Robert Wirtz for presentation to the September, 1964, workshop, Illinois Television Project for the Gifted. (Unpublished).

[2] Sample pages from the Mathematics Project Book will be found in Appendix E.

Suggestions included more precise labeling of worksheets, more explicit instructions to the students as to when to work ahead and when to pay close attention to the television screen, more direct eliciting of overt response from the students, more variety and change of pace, and the inclusion of definitions of terms used that might be new to students. The first two lessons were later re-taped.

Although no Teacher's Guide was prepared for this series during the experimental phase of the Project, the Project staff felt that such a guide would be useful for teachers who might later be using the series without face-to-face orientation, so a brief guide was prepared explaining the mathematical approach of the lessons; use of the workbooks; instructions for building a pegboard device similar to that used during the lessons to demonstrate the areas of shapes laid out on a grid; a copy of the final examination administered to students at the end of the experimental phase of the Project; and a bibliography of selected books recommended for additional reading.

Geography

The curriculum materials for the Geography series were developed by Professor Everett G. Smith, Jr., of the University of Illinois Department of Geography. As the social studies curriculum at the intermediate level has typically developed, geography has tended to become fused with a more general study emcompassing elements of anthropology, history, and economics. This perhaps represented a reaction from geography as presented in the schools a number of years ago: a descriptive and sometimes sterile memorization of place names, predominant crops, major rivers, and other factual details.

The primary idea behind the development of this brief "umbrella" course in geography was to develop a few very basic geographical concepts in such a way that the student might see their applicability to any geographical area of the earth. A student should, after viewing the lessons, be able to apply the concepts he has learned to any landscape, whether man-made or natural. Thus, a student truly interested in geography might well use these lessons as a "take off" point for further independent observation and study.

The materials are organized around four main ideas: (1) the idea of the map as a not-true representation of the earth, using symbols to convey information; (2) the idea of spatial association of different kinds of distributions; (3) the idea of the "man-made landscape" in which most of humanity lives its life; and (4) the idea of the variety of man on earth. The student is encouraged to think as a geographer thinks in terms of the relationship of different features.

The concepts developed contain a great deal of "intellectual mileage." Once the student has grasped the idea that the many kinds of distributions of earth features, both man-made and natural, are interrelated and have profound implications for the human beings living in those localities, he should be able, through an examination of maps, photographs, and actual landscapes, to generalize and even to make predictions. He should, for example, be able to predict whether or not his own community will grow or decline, and if it will grow, he should be able to predict the direction of that growth.

A real appreciation of maps as the most useful means of showing the various distributions of earth features -- and their interrelationships -- is also developed. The limitations and advantages of maps are discussed. While no sophisticated study of map projections is undertaken, students should become aware that there are advantages and disadvantages inherent in different kinds of projections, and, more importantly, they should understand why different kinds of map projections are necessary to an understanding of different aspects of the earth's features.

The lessons should have contemporary relevance, too, in enabling students to understand how geographical features interrelate with other factors to produce widely different economic conditions throughout the world. Emphasis is also found in a study of the growth of urban areas, and the human problems attendant on that growth. Concepts developed are applied to one particular urban area, metropolitan Chicago, in such a way that the student might have guidelines toward applying the same concepts to his own analysis of other metropolitan areas.

The Geography lesson scripts were in the form of detailed outlines of the lesson materials prepared by Professor Smith.[1] While visual effects and illustrations sought for in these lessons were somewhat less complex than those found in portions of the Astronomy series, a number of maps, drawings, and slides were used, and one lesson incorporated a film, "The Impossible Map," produced by the National Film Board of Canada.[2]

It was in the preparation of the Geography series that time pressures were felt most acutely by those involved in the Project. Professor Smith was not released from other responsibilities to begin work on the series until the summer of 1964, during which he was available to the Project on a half-time basis. Tapings of the lessons did not begin until late fall 1964, and because of tight studio schedules ran just comfortably ahead of the scheduled dates for telecasting. As a result, it was not possible to pre-test any of the lessons, although some materials were tried out in the classroom of a local school. A consultant specializing in education of the gifted from the College of Education was available to read only the first lesson script and second lesson outline and to discuss the general ideas and concepts to be developed in the course. A teacher from a local school, who was knowledgable both in instructional television and special problems involved in the education of intermediate-level gifted students, read the first three scripts and offered excellent suggestions for revision. In addition, the Project Director and Assistant Director read each lesson outline, and suggested revisions in the light of their conversations with Coordinators, teachers, and students viewing the two earlier series.

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[1] For a sample page from a Geography script, see Appendix D.

[2] For a discussion of production of this series, see Appendix A.

Project Books for the lessons were developed along with the course materials by Professor Smith and a member of the Project staff. As in the case of the Astronomy Project Books, these contained exercises to be worked out during the televised lesson, as well as problems designed to reinforce concepts previously developed. The greatest emphasis in the Geography Project Book, however, was on activities designed to lead the student toward generalizations and concepts contained in the following lesson. Suggestions for future independent activities based upon the ideas developed in the lessons are presented at the end of the Project Book.[1]

A Teacher's Guide was also prepared, containing lists of equipment needed by the students, summaries of the contents of each lesson, a vocabulary of word and phrases introduced in each lesson, a copy of the final examination administered to students at the conclusion of the experimental viewing, and a bibliography of books and materials for outside reading and activities.

Summary

As mentioned previously, the decision to produce three relatively brief series of lessons in different subject matter areas was based upon the premise that more valid generalizations about the effectiveness of curriculum enrichment by television would result. The length of each lesson, twenty-eight minutes, was dictated by the time segments used in commercial television broadcasting, while each series was limited to twelve lessons by the time limitations of the experimental project itself.

One of the series, Astronomy, was based directly upon materials developed by an on-going curriculum project of the University of Illinois, while the Mathematics lessons were related to another curriculum project. The third series, Geography, represented in itself a brief exercise in curriculum development. While there were obvious advantages in using previously developed astronomy curriculum materials, the use of these materials presented the lesson developers with some difficult problems in pacing lesson materials to fit into twelve twenty-eight minute segments, and a thirteenth lesson was later added to the series to develop further some materials not adequately presented in an early portion of the series. Problems of pacing were more easily solved in the two series developed especially for the Project -- Mathematics and Geography.

A variety of approaches to the problem of scripting televised instruction were used: the Astronomy lessons were fully scripted; a detailed outline was used for the Geography lessons; while the Mathematics lessons were based solely on drawings of the various visuals to be used during the lesson.

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[1] For sample Project Book pages, see Appendix E.

Pre-trials were made of early lessons from the Astronomy and Mathematics series, and results of the pre-trials brought about the revision and re-taping of the entire first Astronomy lesson, and part of the third lesson. The first two Mathematics lessons were completely revised and re-taped. Ideally, of course, all lessons should have undergone pre-trials and revision, but time pressures precluded this. Time limitations also prevented any televised pre-trials of the Geography lessons, although some of the materials used were tried out by the television teacher before pupils in a local school. The Geography lessons did benefit, however, from the experience gained by the Project staff through visits to schools where students were viewing lessons from the other two series, and through conversations with pupils, teachers, and coordinators regarding the strengths and weaknesses of the lessons already viewed.

In all three of the enrichment units, an effort was made to involve pupils actively in the lesson by asking them to work along in their Project Books during the televised lesson. The Mathematics series emphasized active participation to the extent of asking students to work in their Project Books at their own pace during every televised lesson, while the other two series asked for active participation often, but less frequently.

In accordance with the findings of educators with regard to the intellectual strengths and needs of gifted children, all three of the series sought to emphasize the development and application of basic concepts rather than isolated facts, and to present materials in a logical sequence that could be grasped, and even extended, by the viewing students.

CHAPTER 3

Procedures and Methods of the Experimental Study

Design of Study and Selection of Schools

The experimental design was established so that each student acted as both a control and experimental subject during various phases of the study. An initially proposed design calling for five experimental schools and five control schools was modified and fifteen schools or school centers were selected. School centers were areas in which two or more schools participated in the Project under the supervision of one Coordinator, such as Argenta-Oreana which had Argenta Elementary School, Oreana Elementary School and Argenta-Oreana Junior High School participating as a unit.

Each school or school center participated as an experimental school for two of the series, and as a control school for the third series. The fifteen schools were selected on the basis of: (1) interest in applying for the project, (2) enrollment of 80 or more fifth and sixth grade students, and (3) obtaining some balance between rural and urban schools and some balance between schools with higher and lower socio-economic populations. Schools were assigned as controls according to their own preferences for series they wished to view and according to the design of maintaining balance in rural-urban and socio-economic characteristics. In only two or three cases did schools have to miss a series for which they had expressed a preference. By allowing each student to serve as both an experimental and control subject, the effect of novelty was controlled. All students became part of the Project and the control school students and parents were as equally involved and excited (or not excited) as the experimental students.

The production and testing of three different enrichment units as a part of the experimental design made possible three replications of the same basic study, thereby allowing some generalization to be made over course content. The fact that experimental results for the three series differed somewhat, as is indicated in Chapter 4, indicates that some of the conclusions to be drawn must be specific to the particular subject matter presented and to the manner in which it was presented.

Three basic hypotheses were advanced as the focus of the evaluation.

H1: Students viewing the lessons would score higher on achievement tests in the subject area than students not viewing the lessons.

Notice that the test is not whether television instruction by itself without the active involvement of the classroom teacher can be as effective as some other method of presentation, but whether it can be better than nothing at all. If the hypothesis is supported it would indicate that not only can material for the gifted be presented over television in such a way that learning can occur, but that in these particular lessons material was in fact presented in such a way that enough attention was paid to it for learning to occur.

> **H2:** Students viewing the lessons would not fall behind in their regular classwork during the period of the telecasts.

The contention is that gifted students can easily take part in a limited program for the gifted outside of their regular classroom and still keep up with their other work. Since the material to be presented was not intended in any way to supplant the regular curriculum, some check on the ability to handle additional learning situations without detriment to the regular curriculum objectives was felt necessary.

> **H3:** Students viewing the lessons would exhibit more favorable attitude and motivational behavior toward the subject areas of the telecasts than students not viewing the lessons.

One of the objectives of the lessons was to stimulate the gifted child to cognitive efforts and self-directed learning beyond his usual level. It was assumed that the lessons brought in over television would offer material in a way that could really capture the interest and efforts of the high ability child. It was not so much the learning of information or concepts, as the stimulating of interest in getting out and doing something on his own, the self-realization that there were exciting thoughts that he could think about astronomy, mathematics, or geography, that the Project hoped for. Evidence of favorable attitude change or of interest in the subject matter would be interpreted as desired changes in the student's behavior.

Situation in the Schools

Following the initial inquiry from each school and tentative selection of schools, the Project staff visited each school in the spring of 1964 to talk with the school staff and to lay the groundwork for the next year's broadcasts and evaluation. School enrollments varied from 175 to 625. The schools had a variety of already existing programs for their students. Only one of the experimental schools had an extensive program for the gifted student at the fifth and sixth grades, seven others had some degree of grouping of the more able children into one class or identifying them within the class and providing extra materials. Seven of the schools made no distinctions for their more able fifth and sixth grade students.

Seven of the schools had used instructional television prior to the Illinois Television Project for the Gifted, by participating in the Midwest Program on Airborne Television Instruction (MPATI). One of the school centers was interested enough in television to install closed-circuit television facilities in its new junior high school building. The other eight schools had had no regular experience with instructional television.

A person was selected in each of the schools or school centers to serve as a Coordinator between the Project and the school. This person was asked to supervise the operation of the program in the school, administer tests and questionnaires, and to make periodic reports to the Project. In eight of the schools the Coordinator was the school principal or supervisor, and in the other seven schools the Coordinator was one of the teachers whose students were participating in the Project.

In all the schools students from different classes were pooled together to watch the lessons in one or two rooms. In some cases just a few students from each class were brought together, and in other cases half or more of a class would combine with another class for viewing. For example, half of one fifth grade class might go into the other fifth grade class to view, while half of the other class would go into the first class to work with the teacher during the telecast period. In five of the schools the viewing was done in one of the regular classrooms, in two schools viewing was held in unused classrooms, while in eight of the schools other separate rooms such as music rooms and libraries were used for viewing rooms. It had been thought before the Project that some of the schools might try putting their few gifted students in the corner of their regular room and let them view the lesson while the rest of the class went on about their work, turning the set so that it was not a distraction. No school tried this arrangement during the Project although such a setup has been used successfully in some schools on other occasions. Altogether, children from 75 to 80 classrooms participated in the Project.

Selection of Students

A second visit was made to each school during spring, 1964, during which time the students were selected who were to participate in the evaluation. Selection was made by the Project Director after consulting with the school principal and teachers, and reviewing the test records for each student. Selection standards were kept fairly liberal, both to satisfy logistic problems within some of the schools and to allow for some investigation of differences in results due to differences in abilities. Basically students were selected who scored on group ability tests around an IQ level of 125 or 130 or higher and who scored on achievement tests two years or more ahead of their grade placement. Teachers were consulted on students with inconsistent test scores (e.g., a student with a third grade IQ score of 138 and a fifth grade score of 118 and achievement scores one-and-one-half years ahead of placement). Occasionally teachers would recommend a student who had only slightly above-average test scores (e.g., IQ scores around 110-115), but who performed well in class, and in other cases would recommend against students with fairly high test scores but who were not performing well in class. Decisions on these students were made by the Project Director.

A final list of recommended and acceptable students was made up by the Project Director. Although the experimental schools were allowed to include or not include selected students in the final sample, in most cases the recommendations made to them by the Project Director were followed. Based on the reported sizes of each school, about 30% of the school enrollments were in the fifth and sixth grades. The sample selected was 580 students out of a possible 2,190 students, or 25% of the two grades. The proportion of fifth and sixth grade students selected in each school varied from 8% of the students to almost 50% of the students. Clearly, many more than "gifted" children were included. A few students new to the schools were added to the experimental group during the fall of 1964.

Collection of Data and Description of Instruments

Tests and questionnaires were administered to experimental subjects before and after each series of telecasts.[1] In September, 1964, just after school started, the Henmon-Nelson Test of Mental Ability (Grades 6-9, Form A)[2] was administered by the school Coordinators. The scores were transformed into IQ measures on the basis of the standardized tables published for the test. The Sequential Tests of Educational Progress (STEP)[3] in science, mathematics, and social studies were also administered before the appropriate enrichment unit was viewed. The raw scores from each STEP test were used in the analysis. The STEP Science Test (Form 3B, Part two) and some attitude instruments were also administered before the first telecast.

The first week after the end of the Astronomy series, the STEP Mathematics Test (Form 4A, Part one), and the third questionnaire were given. The second week after the end of the Astronomy series, which was the week before the Mathematics series began, the astronomy test and a fourth questionnaire were administered. The same procedure was followed for each of the other two series, with the STEP test serving as a control variable being given two weeks before the start of the next series, and the achievement test being given two weeks after the end of the previous series. The STEP Social Studies Test given was Form 3B, Part one. Altogether seven questionnaires and seven tests were administered. At the end of the three telecast periods each student was rated on four characteristics by his regular classroom teacher or by the school Coordinator: (1) evaluation of the student as an under- or over-achiever; (2) student effort or how hard he tried; (3) estimated ability of the student for an independent study program; and (4) the student's success in the Illinois Television Project for the Gifted in carrying out independent activities.

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[1] For the schedule of tests and questionnaires, see Appendix B.

[2] Published by the Houghton Mifflin Company, Boston.

[3] Published by the Cooperative Test Division, Educational Testing Service, Princeton, N. J.

The end-of-telecast achievement tests were constructed particularly for the television lessons by the Project Director. The astronomy test was partly adapted from tests developed for the Elementary-School Science Project by Peter Shoresman and Ed Eaton. Each of the three tests included some factual items, but attempted to stress testing of the student's ability to transfer learning to new situations. Although each item was related to the television series, only those items that could reasonably be answered by a student not seeing the lessons were included. Thus, improvements in test scores for viewers of the television series could be attributed to increased learning of the concepts and generalizations developed during the lessons. The astronomy test was composed of 55 items and the chance score was 12. The mathematics test had 27 items and a chance level score of 6. The geography test was composed of 49 items and had a chance score of 13. Reliabilities of the tests were in the high .60s and low .70s. Copies of the tests as finally revised are available in the Teacher's Guide for each series.[1]

The questionnaires included many different items. A Thurstone type of attitude scale was used as one of the attitude measures.[2] Other basic attitude measures used were semantic differential forms[3] on which the student evaluated such concepts as ASTRONOMY, MATHEMATICS, GEOGRAPHY, THE TELEVISION COURSE ON ASTRONOMY (and MATHEMATICS and GEOGRAPHY), INSTRUCTIONAL TELEVISION, MISS GAIL PIERCE-The Teacher on Television (and MR. WIRTZ and MR. SMITH). Evaluations on the semantic differential are made by the student checking a seven-point bi-polar scale indicating his evaluation of a concept as being closer to one end of the scale or the other. For example, the student rates MATHEMATICS as being closer to to Good (1) or Bad (7).[4] In reporting the results in the next chapter, the two words describing the ends of the bi-polar scales are given, with the end on the left representing a score of one, and the end on the right representing a score of seven.

Between each series each student ranked science, arithmetic, and geography, along with six other subjects, from one to nine in terms of usefulness and in terms of interest. In the tables in the next chapter the rankings are reported with the highest rank equal to nine, and the last or lowest rank equal to one. Thus, the higher the ranking score, the more favorable the response.

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[1] Teachers' Guides may be obtained from the University of Illinois Press, Urbana, Illinois.

[2] See Appendix F for details.

[3] C. E. Osgood, G. J. Suci, and P. H. Tannenbaum, The Measurement of Meaning (Urbana, Ill.: Univ. of Illinois Press, 1957).

[4] See Appendix G for an example of one of the semantic differential forms.

Students were also asked how many books they had read during the past 30 days, and then to name the books they had read. The number of science, astronomy, mathematics, and social studies books each student reported having read counted as a measure of interest in the subject. A science activity index,[1] some creativity tests,[2] and some items getting at academic motivation were also included. The motivation items asked the following questions: (1) How hard do you work on your school work in comparison with the typical student of your sex? (2) Do you find studying a pleasure? (3) When you set goals for studying, do you achieve your goal? (4) Do you generally find school interesting or dull? and (5) How important are good grades to you?

After each series, the Project Books were collected, and selected pages examined. The number of these pages completed or worked on by each student was counted as a measure of interest in doing the activities suggested by the course. After the mathematics series was broadcast, each student was given a sheet of paper offering free activity kits.[3] The kits offered were mathematics or space and astronomy. The distribution of requests sent back to the Project for the mail-in kits was used as a behavioral measure of interest.

Analysis of Data

The analysis of the data was generally a straightforward comparison of experimental and control groups (or viewers and non-viewers). The statistical methods employed were analysis of covariance, correlation and chi square. The questions being asked in each statistical test basically were either (1) Does the mean score on some variable in one group differ from the mean score for that variable in another group? or (2) Does the distribution of a set of scores in one group differ from the distribution of a set of scores in another group? The probability or significance level is reported throughout the report as p (e.g., $p = .05$). This indicates that the probability that the difference reported could be a chance difference is equal to or less than .05 (5 out of 100).

The data was analyzed using statistical programs on one of the University of Illinois Department of Computer Science computers - the IBM 7094.[4] Less formal evaluations and comments from students and teachers were also used for informal evaluations of the Project.

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[1] See Appendix H for details.

[2] See Appendix I for details.

[3] See Appendix J.

[4] The 7094-1401 installation is partially supported by a grant from the National Science Foundation, NSFGP-700.

CHAPTER 4

Results of the Experimental Analysis

Summary of Results

There were 570 fifth and sixth grade students in the experimental sample, with an average IQ of 124 and an average age in September, 1964, of 10 years, 4 months. The sample was about evenly divided with regard to sex, grade level, and size of home town, but had a relatively high proportion of children with college educated parents. Two subgroups also were evaluated: a high ability subgroup with an average IQ of 135, and a low ability subgroup with an average IQ of 100. This latter group was not composed of students originally selected to participate in the experiment, but was added later so that some determination of the effectiveness of the lessons when viewed by low ability students might be made.

Hypothesis 1 (H1): Students viewing the lessons would score higher on achievement tests in the subject area than students not viewing the lessons.

This hypothesis was supported. Learning occurred during all three of the televised enrichment units, with students viewing each series of lessons scoring significantly higher on the achievement test than the control non-viewing group in each case. For the total sample, viewing the lessons improved test scores 30% in astronomy, 35% in mathematics, and 12% in geography. For the high ability subsample, the improvements were 31% for astronomy, 16% for mathematics, and 18% for geography.

Hypothesis 2 (H2): Students viewing the lessons would not fall behind in their regular class work during the period of the telecasts.

The hypothesis was supported. Although no objective measurements of this hypothesis were attempted, the teachers reported that only a few students were unable to handle the additional work successfully. Only about 5% of the students reported that they were having quite a bit of difficulty in keeping up with their regular class work during the telecast period.

Hypothesis 3 (H3): Students viewing the lessons would exhibit more favorable attitude and motivational behavior toward the subject areas of the telecasts than students not viewing the lessons.

This hypothesis was partly supported for the Geography enrichment unit, but was not supported in the Astronomy and Mathematics units. Out of thirteen basic attitude-motivation-interest criteria, the Astronomy viewing group was significantly more favorable on only two criteria; the Mathematics viewing group was significantly less favorable on three criteria; and the Geography viewing group significantly more favorable on five criteria. A comparison of the viewing and non-viewing groups for just the high ability subsample reveals that only one of the thirteen criteria showed significant differences for the Astronomy and Geography series (viewers more favorable), and no significant differences occurred for the Mathematics series. For both the total sample and the high ability subsample, other differences were not significant and inconsistent in direction.

Comparisons of before and after evaluations for each series by viewers and non-viewers on the concepts ASTRONOMY, MATHEMATICS, and GEOGRAPHY indicated a slight negative shift for viewers during the Astronomy and Mathematics series, and a slight positive shift for viewers during the Geography series. A delayed measure four months after the Astronomy series indicated a significant negative drift in attitude for the Astronomy viewers.

Student Attitude Toward the Enrichment Units

In terms of how the students liked and performed in the courses, the results were essentially favorable for all three series. There was a relatively high rate of completion of Project Book activities, with 16% to 69% of the students doing all of the activities counted, and 68% to 99% doing some or all of the activities and workbook pages. When asked directly how they liked the series, 63% of the Astronomy viewers and 67% of the Mathematics viewers said they liked the lessons, while 15% of the Astronomy viewers and 14% of the Mathematics viewers said they disliked the lessons. Liking of the lessons was not significantly related to scores on the achievement tests nor to ability. When asked how well they understood the lessons, 47% of the Astronomy viewers and 72% of the Mathematics viewers said they understood the lessons, while 28% of the Astronomy viewers and 9% of the Mathematics viewers said they did not understand the lessons. Self-reported understanding of the lessons was not significantly related to ability, although the high ability subsample did report more understanding of the lessons.

On a separate measure of liking and understanding, using the semantic differential responses of dull-interesting and easy-difficult, both the total sample and the high ability subsample ranked Astronomy as most interesting and most difficult, Mathematics ranked second, and Geography third. The high ability subsample evaluated each subject as less difficult than the total sample's evaluation. There was a significant relationship between ability level and achievement test scores, and between ability level and number of pages worked in the Project Books. There were virtually no other significant differences on performance criteria among students of different ability levels.

Interest in the lessons, as expressed verbally, was significantly related to actual work in the Project Book and to sending in for mail-in activity kits. Viewing a particular series, however, was not related to sending in for mail-in activity kits related to the series viewed.

There was a high rate of parent interest reported, with 80% of the Astronomy students and 65% of the Mathematics students reporting that their parents watched the lessons. A sizeable home-viewing audience was found in a survey conducted by the television station that broadcast the lessons. Some 60% of the Astronomy viewers and 41% of the Mathematics viewers reported that their parents sometimes gave them help with the lessons.

Independent Study

Teachers reported informally during the experiment that the motivation of the student, in the context of the experimental conditions calling for acceptance of self-directed learning, was related to success in the course. Each student's ability for independent study situations, as rated by the teachers after the experiment was significantly related to academic ability, but was not significantly related to achievement nor to performance in the course. Capability for independent study, as measured by student performance at completing Project Book pages on their own, was significantly related to ability and also was significantly related to achievement and performance in the course.

General Description of Sample and Variables

The sample finally used in the analysis were those students who had taken the two series of tests in September - the ability test and the science achievement pre-test. During the course of the year a few students were dropped from the classes viewing the lessons because of moving or because the teachers felt the students would be better off remaining in the regular classroom. A few students were added to the viewing groups, but these students were not used in the analysis since the base line IQ score was not available for them.

A total of 570 students were in the sample. These constituted about the top 25% of the fifth and sixth grade populations in our experimental schools. The average IQ based on the group ability test administered in September was 124. Some 10% had IQ scores of 135 or better and about 2-1/2% had IQ measures of 140 or better. Later in the analysis, each student was categorized on the basis of all the achievement and test score information available in his school folder. These categorizations, made by the Project Director, are referred to in the study as the ability index and can be interpreted as: (1) those at or below national means or IQ scores 60-100 and achievement scores at or below grade; (2) those from mean to one standard deviation above the mean, or IQ scores 100-116 and achievement scores at grade level to one year ahead of grade placement; (3) those from one to two standard deviations above the national mean, or IQ measures of 116-132 and achievement test scores from one to two-and-one-half years ahead of grade; and (4) those students more than two standard deviations above the mean, or IQ measures above 132 and achievement placements more than two-and-one-half years ahead of grade. Of the 570 students, none was in group 1, 11% were in group 2, 71% were in group 3, and 18% were in group 4. The 103 students in group 4, with an average IQ of 135, represented about 5% of the total fifth and sixth grade populations in our experimental schools, and can be considered the group that typically would be classed as the truly gifted child.

The sample was about evenly split on sex, grade level, and size of town. There was a high proportion of children with college educated parents (61%). The average age of the children in September, 1964, was 10 years, 4 months, with a range from 9.2 to 12.4.

The total number of experimental students viewing the Astronomy series was 331, the number of Mathematics viewers was 393 and the number of viewers for the Geography series was 416. The number of non-viewers or control subjects in each case was the balance of the 570 students in the sample. The variations in size of the viewing samples were due to the different sizes of the schools assigned to watch each series. For most of the analyses reported in the remainder of this chapter, only those students were used who had complete data on all variables under consideration for that particular analysis. Thus the actual N's or number of subjects reported will vary from analysis to analysis or from table to table.

A separate subgroup from a non-experimental school was studied during the latter part of the Project. The students in this sample, with an average IQ of 100, were studied to evaluate the effect of teacher motivation on what was otherwise a disparate matching of student ability and content levels. The analysis of this subsample is reported in Appendix L.

The experimental (viewers) and control (non-viewers) groups for each series were compared. The following variables at one time or another were significantly different for the two groups: STEP achievement tests, rural versus urban location of school, socio-economic level of school population, father's occupational level,[1] father's education, and mother's education.[2] Rather than make the assumption that these and other variables were or were not influencing the relationship between viewers and non-viewers on our criterion measures, selected variables were uniformly controlled on all analyses of covariance. That is, the effects, if any, of certain variables were always removed before making a comparison of the two groups or of other relationships. The variables that were always controlled for were:

IQ
STEP achievement test scores
age
sex
grade level (fifth or sixth)
rural versus urban location of school
socio-economic level of school
father's occupational level
father's education
mother's education
academic motivation scale

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[1] See Appendix K for coding categories used for occupational status.

[2] See Table 21 in Appendix M for further details.

Table 1 indicates the relationship among the various ability and achievement measures.

Table 1

Correlations Among Ability and Achievement Scores

	IQ	Astr Test	Math Test	Geog Test	STEP Sci.	STEP Math	STEP Soc.	Ability Index
IQ	--	.35	.34	.44	.29	.33	.44	.71
Astr. Test . .		--	.31	.38	.44	.45	.45	.36
Math Test . .			--	.40	.25	.45	.39	.37
Geog. Test . .				--	.37	.43	.56	.36
STEP Science .					--	.41	.49	.28
STEP Math . .	(N = 473)					--	.49	.32
STEP Soc. Std.							--	.42
Ability Index								--

Note: All correlations are significant at the .001 level.

Achievement in Courses

The first hypothesis simply said that learning would occur. As Table 2 indicates, the hypothesis is supported. On each series the viewers scored significantly higher on the achievement test than the non-viewers. The results in Table 2 are adjusted for differences on the standard set of covariables described earlier, including IQ and the STEP achievement pre-test.

Looking at the results in terms of differences in scores, it can be said that six hours of television lessons improved astronomy scores 30%, improved mathematics scores 35%, and improved geography scores 12%. On the other hand, the scores are all low relative to the maximum possible score on each test (55 for astronomy, 27 for mathematics and 49 for geography). The tests were constructed to be parallel in difficulty with the material being presented. The relatively low scores indicate that learning could have been more effective. Comments from the students as to the difficulty of the astronomy course and on the unequal difficulty of various parts of each series also suggest that conceptual and factual learning could have been more effectively induced.

Table No. 2[a]

Results of Analysis of Covariance on Achievement Test Between Viewers and Non-Viewers for Each Course

Course	Group	N	Mean	Effect	F	df	Sig.
Astronomy	Viewers Non-Viewers	289 173	23.55 18.11	2.56 -2.56	118.45	1& 449	.001
Mathematics	Viewers Non-Viewers	296 157	16.31 12.10	2.10 -2.10	181.53	1& 440	.001
Geography	Viewers Non-Viewers	333 119	24.06 21.57	.80 -.80	11.27	1& 439	.001

[a] For a brief explanation of the terms used in the statistical tables, see Appendix M.

Effect on Regular Classroom Work

Because the design did not allow for control of the school curriculum such that all students would miss the same subject during the viewing period, no direct test of the effect of viewing on regular classroom work was possible. Some of the students viewed during their study period, and in these cases missed only the time they would have had for other homework. Many of the students missed either a language or arithmetic period, or part of a period. In one school the students missed a televised foreign language lesson part of the time. The principal in this school arranged to audio tape record the foreign language lessons and the high ability students watching the Project lessons then listened to the language tapes later in the day.

Reports from the Coordinators and from the classroom teachers indicated that there was no real problem in the participating students keeping up with their regular work. The teachers' judgments were that either the children already knew the material being covered in the classroom, or were capable enough to pick it up on their own during the rest of the day. In a few cases, however, the school staff judged that certain individuals were not benefiting from the lessons and would be better off working on their regular material. Several of these children were withdrawn from the program. None of these cases were those that were clearly in the gifted category according to test scores.

When the students themselves were asked: "Did you have any difficulty keeping up with your regular classroom work during the weeks you were viewing the television lessons?", the results were as indicated in Table 3. The question was inadvertantly omitted from the last questionnaire covering the Geography series.

Table 3

Per Cent of Viewers Reporting Difficulty in Keeping Up with Regular Classroom Work During the Television Series

Any Difficulty?	Astronomy Viewers N=331	Mathematics Viewers N=376
Yes, Very Difficult	5%	4%
Yes, a Little Difficult	45%	37%
No, Not At All Difficult	50%	59%

Although hypothesis two, that gifted students viewing the telecasts would not fall behind in their regular classroom work, was not statistically tested, the results clearly support the hypothesis.

Attitudes, Behavior and Motivation Related to the Telecasts

A variety of items and measures were obtained to get at various aspects of interest and attitude, as explained in Chapter 3. From the generally low correlations found among the attitude measures, it can be concluded that: (1) a variety of behavioral bases are being measured which are largely independent of one another; and (2) there is probably a fairly low reliability or high error component in many of the measures.[1]

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[1] See Tables 22, 23, and 24 in Appendix M for details.

The basic tests of hypothesis three, that viewers of each series would exhibit more favorable expressions of attitude than non-viewers, are shown in Tables 4, 5, and 6. These tables indicate the differences between the viewing and non-viewing groups and the significance of the differences after adjusting for the standard set of covariables described earlier. Also adjusted for were the pre-telecast scores on the criterion variable. For example, in Table 4 the difference between viewers and non-viewers in November on their rankings of science as a subject in terms of usefulness is adjusted for each subject's ranking of science in September before the telecasts. This procedure in analysis of covariance allows for post-telecast scores to reflect accurately the changes and differences over the period of the broadcasts.

Only two of fourteen criteria indicated in Table 4 show significant results on the Astronomy series. The viewing group read more science books during the last 30 days of the series, and ranked science as more useful. The other measures were inconsistent, with many of the semantic differential evaluations of astronomy indicating the non-viewing group was more favorable, although not at a significant level.

Three out of thirteen criteria on the Mathematics series show significant differences between viewers and non-viewers. As Table 5 indicates, however, these differences are in the wrong direction. The control or non-viewing group ranked arithmetic as a subject as more useful and more interesting than the viewing groups after the telecasts. Some of the non-significant differences favor the viewing group, such as the attitude scale and the number of mathematics books read.

Five out of thirteen criteria on the Geography series indicated in Table 6 show a significant difference between viewers and non-viewers, and all differences favor the viewing group. Viewers evaluated geography as more good, clear, exciting, expert and easy than non-viewers. The attitude scale and subject rankings showed no difference. The non-viewers tended to read more social studies books.

The changes in evaluative responses from before telecasts to after telecasts are displayed more graphically in Figures 1, 2, and 3. These figures show the mean response to the semantic differential items for the viewing and non-viewing groups.

As Figure 1 indicates, there was a clear negative drift in evaluation of astronomy by the Astronomy series viewing group. The non-viewers, in contrast, tended to remain at about the same position. Four months after the broadcasts, in March, the viewers were significantly less favorable to the concept ASTRONOMY on most items.

Figure 2 indicates a slight unfavorable shift in evaluation among the Mathematics viewers while the non-viewers again remained at about the same level. Figure 3 indicates a favorable shift in attitude from before telecasts to after telecasts among viewers of the Geography series. Non-viewers had a slight negative shift.

Table 4

Analysis of Covariance Results on Astronomy Post-Telecast Criteria Scores

Criterion	Viewers Mean (Unadjusted)	Non-Viewers Mean (Unadjusted)	t Value (Adjusted)
Achievement Test.................	23.6	18.1	10.88**
Number of Science Books Read During Last 30 Days of Series...	0.61	0.30	3.07*
Rank Placement of Subject in Terms of Usefulness.............	6.56	6.22	2.28*
Rank Placement of Subject in Terms of Interest...............	6.09	6.09	0.22
Science Activity Index...........	2.83	2.83	0.56
Attitude Scale (Thurstone Type)..	7.19	7.09	0.40
Semantic Differential Scales on Concept ASTRONOMY:			
Good - Bad	2.14	2.22	0.57
Clear - Confusing	3.44	2.88	1.54
Exciting - Calming	2.68	2.45	1.13
Useful - Useless	2.02	2.07	1.12
Interesting - Dull	2.37	2.28	0.06
Expert - Inexpert	3.03	2.88	0.13
Easy - Difficult	3.61	3.07	1.32
Active - Passive	2.62	2.71	1.46
Intelligent - Stupid	2.45	2.40	1.73

NOTE: N for semantic differential equals 237; N for rest of table equals 462.

*Indicates difference is significant at .05 level.

**Indicates difference is significant at .001 level.

Table 5

Analysis of Covariance Results on Mathematics Post-Telecast Criteria Scores

Criterion	Viewers Mean (Unadjusted)	Non-Viewers Mean (Unadjusted)	t Value (Adjusted)
Achievement Test................	16.3	12.1	13.47**
Number of Mathematics Books Read During Last 30 Days of Series.........................	0.02	0.00	1.26
Rank Placement of Subject in Terms of Usefulness.............	7.54	7.91	2.89*
Rank Placement of Subject in Terms of Interest...............	6.20	6.38	2.29*
Attitude Scale (Thurstone Type)..	6.97	6.86	0.65
Semantic Differential Scales on Concept MATHEMATICS:			
Good - Bad	1.95	1.87	1.64
Clear - Confusing	2.66	2.54	1.23
Exciting - Calming	2.84	2.74	1.88
Useful - Useless	1.57	1.47	1.97*
Interesting - Dull	2.33	2.27	1.30
Expert - Inexpert	2.48	2.58	0.25
Easy - Difficult	2.98	2.83	1.82
Active - Passive	2.72	2.68	1.08
Intelligent - Stupid	2.09	2.02	1.50

NOTE: N for table equals 453.

*Indicates difference is significant at .05 level.

**Indicates difference is significant at .001 level.

Table 6

Analysis of Covariance Results on Geography Post-Telecast Criteria Scores

Criterion	Viewers Mean (Unadjusted)	Non-Viewers Mean (Unadjusted)	t Value (Adjusted)
Achievement Test..................	24.1	21.6	3.36**
Number of Social Studies Books Read During Last 30 Days of Series..........................	0.06	0.10	1.82
Rank Placement of Subject in Terms of Usefulness.............	5.31	5.58	0.62
Rank Placement of Subject in Terms of Interest...............	5.04	5.10	0.51
Attitude Scale (Thurstone Type)..	6.77	6.96	0.21
Semantic Differential Scales on Concept GEOGRAPHY:			
Good - Bad..........	1.91	2.31	4.01**
Clear - Confusing....	2.36	2.86	3.24*
Exciting - Calming......	2.93	3.16	2.06*
Useful - Useless......	1.70	1.79	1.53
Interesting - Dull.........	2.42	2.43	1.24
Expert - Inexpert.....	2.72	2.97	2.75*
Easy - Difficult.....	2.65	3.10	3.63**
Active - Passive......	2.98	2.78	0.97
Intelligent - Stupid.......	2.19	2.28	1.14

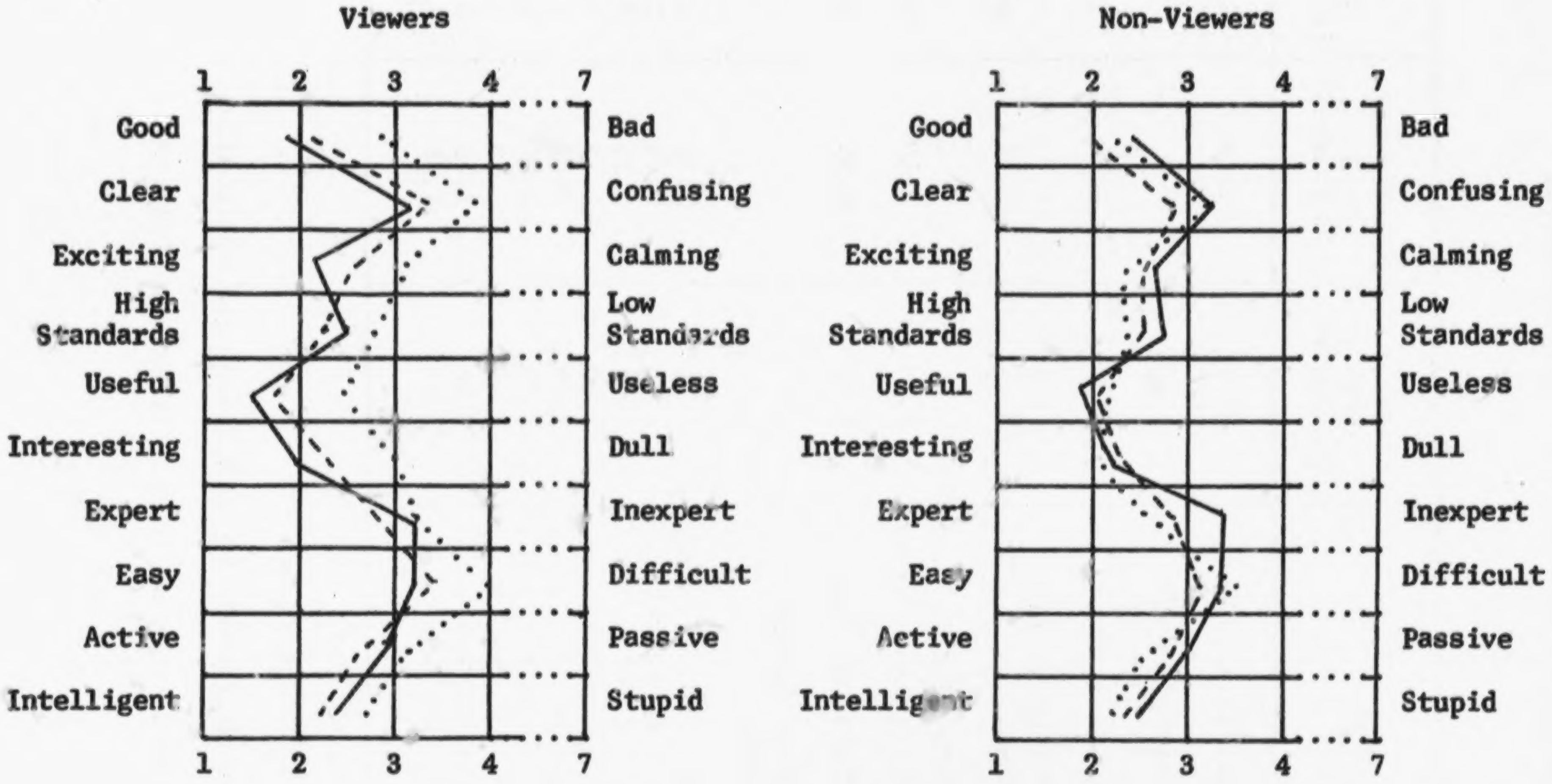
NOTE: N for table equals 452.

*Indicates difference is significant at .05 level.

** Indicates difference is significant at .001 level.

Figure 1

Semantic Differential Mean Scores on Concept ASTRONOMY for Viewing and Non-Viewing Students

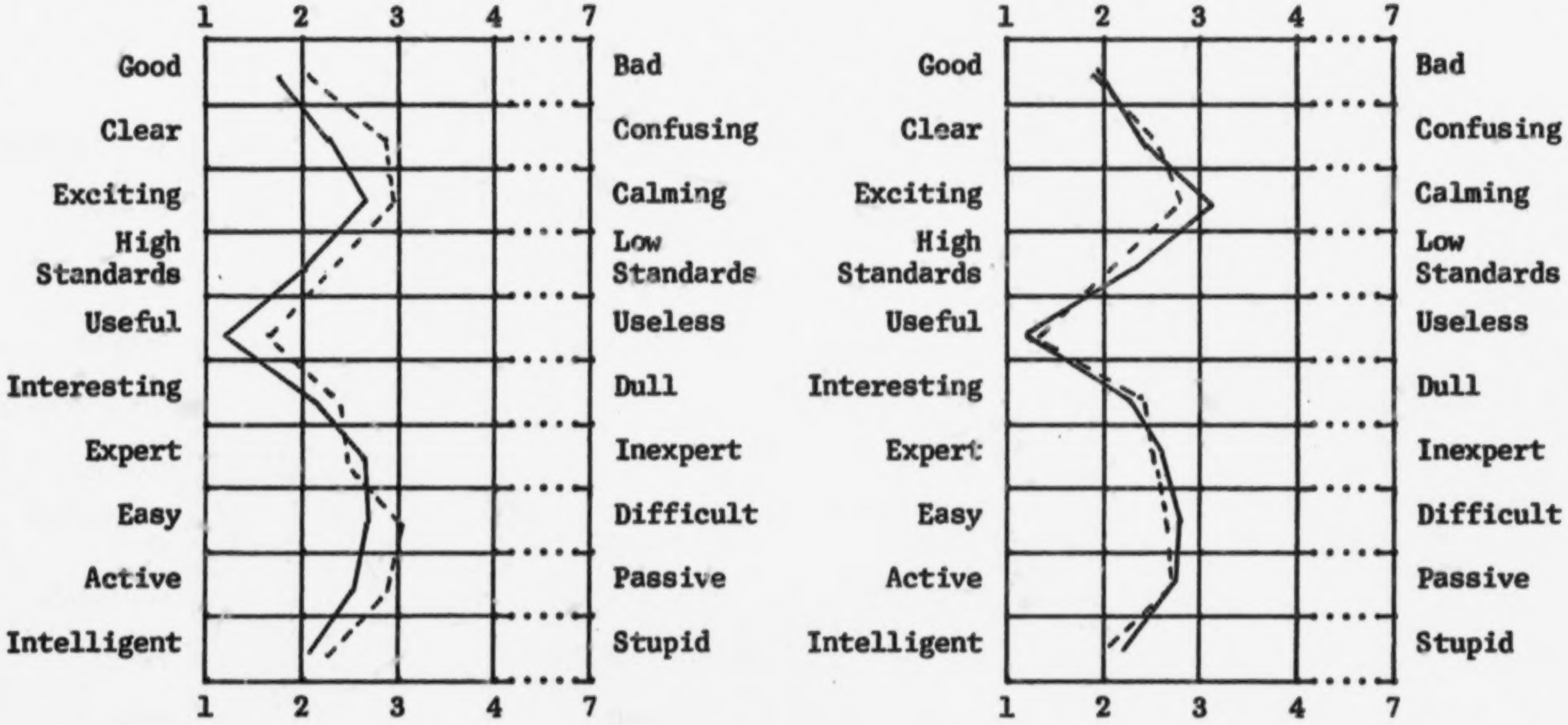

Viewers

Non-Viewers

NOTE: Solid line = September score; dashed line = November score; dotted line = March score

Figure 2

Semantic Differential Mean Scores on Concept
MATHEMATICS for Viewing and Non-Viewing Students



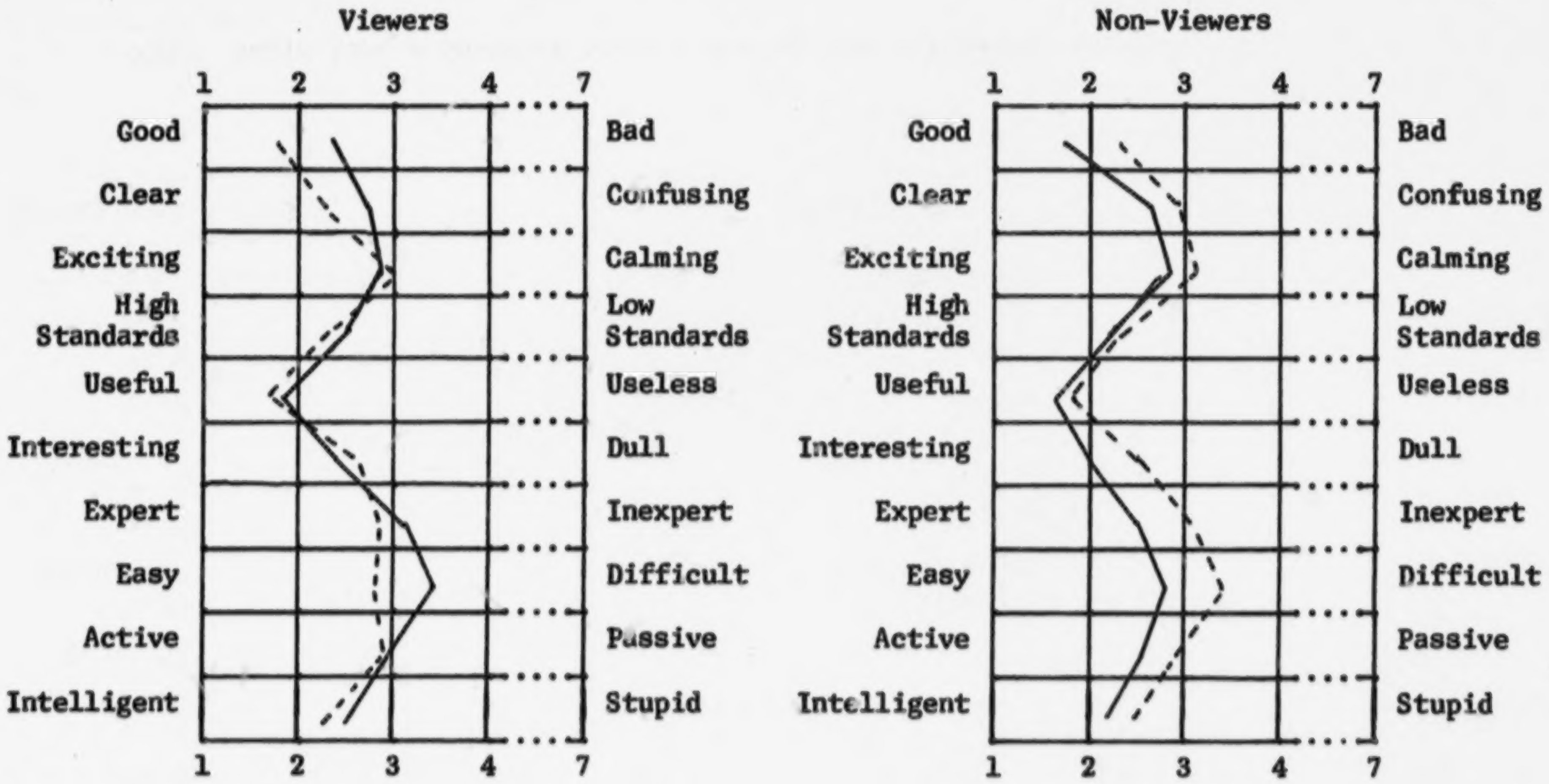
Viewers

Non-Viewers

NOTE: Solid line = November scores; dashed line = February scores.

Figure 3

Semantic Differential Mean Scores on Concept
GEOGRAPHY for Viewing and Non-Viewing Students



NOTE: Solid line = January scores; dashed line = March score.

In all three series there is a characteristic curve with more positive evaluations being made about the subjects in terms of good, useful, and intelligent, and more negative evaluations being made in terms of confusing, calming, and difficult. In particular, the Astronomy and Mathematics viewers tended to evaluate the subjects as more difficult after the series, while the Geography viewers rated the subject as more easy after the series. Evaluating each television series in terms of "easy-difficult" (from 1 to 7) produced average difficulty scores of 4.05 for Astronomy, 3.55 for Mathematics and 2.77 for Geography. For the high ability subsample the average difficulty evaluations for the subjects were 3.06 for Astronomy, 2.86 for Mathematics and 2.71 for Geography.

Basically, then, it can be concluded that the predicted positive attitudinal and behavioral effects occurred slightly during the Astronomy series, not at all during the Mathematics series, and fairly strongly during the geography series.

When the students were asked directly "How did you like the television series on astronomy (Mathematics)?", the results were as indicated in Table 7. Responses to the question "How well do you think you understood the Astronomy (Mathematics) series?", are also indicated in Table 7. Using the evaluative responses "dull (1) - interesting (7)" on the concept THE TELEVISION COURSE ON ASTRONOMY (or MATHEMATICS or GEOGRAPHY), the viewers of each series ranked Astronomy most interesting (5.72), Mathematics second (5.44), and Geography third (5.33).

Table 7

Per Cent of Viewers Reporting Liking and Understanding
Astronomy and Mathematics Series

Response	Astronomy	Mathematics
I Liked Very Much	34%	40%
I Liked Somewhat	29%	27%
Neutral	22%	19%
I Disliked Somewhat	12%	10%
I Disliked Very Much	3%	4%
N	321	377
I Understood Very Well	6%	16%
I Understood Somewhat	41%	56%
Neutral	26%	19%
I Did Not Understand Very Well . .	26%	8%
I Understood Very Poorly	2%	1%
N	129	291

It might be noted that those who reported that they liked the Astronomy or the Mathematics series tended to report that they also understood the lessons (chi square test, significant at .001 level). In neither series, however, was their liking of the lessons related to their scores on the achievement tests. The students' self-report of understanding the lessons was related to scores on the achievement tests. Among the Astronomy viewing group, those who reported liking the series tended to do more workbook activities and outside activities related to the course (p = .023). In the Mathematics group there was no relationship between liking the course and working in the Mathematics Project Book.

The relationship between liking the course and sending in for any one of the mail-in kits was significant, as is indicated in Table 8.

Table 8

Per Cent of Mathematics Viewers sending for Mail-In Kits Related to their Liking for the Course

	N	Liked Very Much	Liked Somewhat	Neutral or Disliked
Sent For Mathematics or Astronomy Kit	177	73%	57%	47%
Did Not Send For Kit	114	27%	43%	53%
N	291	126	76	89
		chi square = 15.37		p = .001

The relationship between liking the Mathematics course and sending for the mathematics material, however, was not significant, although the relationship was in the right direction as Table 9 indicates.

Table 9

Relationship Between Liking the Mathematics Course and Sending for Mathematics Mail-In Kits

Kits Sent For	N	Liked Very Much	Liked Somewhat	Neutral or Disliked
Mathematics	91	55%	53%	40%
Astronomy	86	45%	47%	60%
N	177	92	43	42
		chi square = 2.68		p = .28

Table 10 indicates the distribution of kits sent for according to the viewing group of the student. The top part of Table 10 shows that in detail there are significant differences in the kits sent for according to the programs watched. Students who watched Astronomy and Geography, or Astronomy and Mathematics were more likely to send in for kits than students who watched Mathematics and Geography. Mathematics viewers were more likely to send in for peg board kits. These kits were exactly like the material presented during the telecasts. Astronomy viewers were more likely to send in for the NASA space materials and the mathematical puzzles kits. The emphasis on mathematics within the Astronomy series is probably reflected in the interest in the mathematical puzzles.

Table 10

Relationship Between Viewing Group and
Mail-In Kit Sent For

		Viewing Group		
Kit Sent For	N	Astronomy and Mathematics	Astronomy	Mathematics
None	203	28%	28%	46%
NASA Space Material . . .	131	25%	29%	17%
Star Finder . .	126	3%	8%	10%
Math Puzzles . .	42	25%	31%	14%
Pegboard	68	19%	4%	13%
N	570	154	177	239
		chi square = 57.67		p = .001
Astronomy Kits .	173	39%	52%	49%
Math Kits . . .	194	61%	48%	51%
N	367	111	128	128
		chi square = 4.75		p = .09

When the NASA and star finder kits were combined as astronomy material, and the math puzzles and peg board were combined as mathematics materials, Table 10 shows that there was no real difference among groups. That is, of those that sent in for kits, there was no difference in kits asked for between Mathematics viewers and Astronomy viewers. Those that watched both Mathematics and Astronomy tended to send for the math kits. Students who sent for astronomy kits scored higher on the astronomy test (p = .025), and students who sent for mathematics kits scored higher on the mathematics test (difference was not significant). The total number of students sending in for kits was 64% of the sample.[1]

Table 11 indicates the proportion of students working at the various Project Book activities.

Table 11

Per Cent of Students Working on Various Project Book Pages or Activities

Activity	Worked On All Pages or Activities	Worked On Some Pages or Activities	Worked On No Pages or Activities
Astronomy Pages Worked During the Telecasts . . .	69%	29%	2%
Astronomy Pages Worked After the Telecasts . . .	13%	55%	32%
Astronomy Equipment (Mange-finder etc.) Worked on . .	23%	49%	28%
Mathematics Pages Worked .	16%	72%	12%
Geography Pages Worked . .	22%	77%	1%

The students reported that their parents were interested in the courses and watched the telecasts. After the Astronomy series, 80% of the students reported their parents watched the lessons, with 20% reporting their parents watched most of the lessons. After the Mathematics series, 65% of the students reported their parents watched the lessons, with 12% reporting their parents watched most of the lessons. The questions were inadvertantly omitted from the post-Geography questionnaire. A telephone coincidental survey taken by the broadcasting station, WCIA, in November indicated that 40% of the sets-in-use in Champaign-Urbana were tuned to the Astronomy lesson being broadcast that day. This represents about 1,300 homes watching the lesson just in the immediate area.

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[1] In a similar measure of student response to science experiment kits, G. L. Gropper and A. A. Lumsdaine in The Use of Student Response to Improve Televised Instruction: An Overview (Pittsburgh: American Institute for Research, Studies in Televised Instruction, Report No. 7, 1961) reported that when given a kit in the classroom, 87% of the students selected a kit; when given a postcard to mail in for a free kit, 69% of the students mailed in for a kit; and when just told that they could write in for a free kit if they wished, 37% sent for a kit.

Sixth grade students were rated by their teachers as more able at independent study (p = .001), and were rated as more successful than fifth graders at the independent activity during the Mathematics television series (p = .03) and worked more in the Project Book during the Astronomy series (p = .01). The sixth grade students said they understood the Astronomy lessons better than the fifth grade students (p = .02). The sixth grade, however, did not score significantly higher on the astronomy, mathematics, or geography achievement tests.

Students from schools in more rural areas were more likely to send for a mail-in kit (p = .001) and were more likely to report that their parents had given some help on the telecourses (p = .02). In all, 60% of the Astronomy viewers and 41% of the Mathematics viewers said their parents had given them some help in the courses.

Creativity as a Variable

An additional series of analyses involved the relationship of creativity to success in the courses. The creativity measures used were from among those reported by Torrance at the University of Minnesota.[1] While creativity was not one of the variables considered in the original proposal, it was felt that at least some check should be made of the influence of creativity as an aptitude upon the students' reaction to the telecasts. It was considered possible, for instance, that some of the affective behavior would be related to the novel and unique elements of the lessons and activities which in turn could be a reflection of the gifted child's ability to handle creative situations or to work self-satisfyingly at activities calling for new approaches.

The two creativity tests administered were an unusual uses task (the Tin Can Uses Test) and a creative activities check list. Details on the tests and their scoring are given in Appendix I. The activities check list provided a single score of creative activity undertaken during the preceding half year. The unusual uses task provided scores for fluency (number of uses given) and originality (number of truly unique or original uses given). The three scores were not highly interrelated: creative activities correlated .11 with fluency and .15 with originality, while fluency correlated .34 with originality. While these are significantly non-zero correlations (p = .05 or better, N = 473) they share little variance in common.

The relationship of creativity as measured in this project with the achievement and attitude criteria was virtually nil.[2] During the course of the analysis few other significant effects of the creativity scores were found. Students who reported they understood well the Mathematics series scored higher on fluency than those students reporting trouble in understanding the math series (p = .025). So far as it can be judged from the measures used in the present study the creative aptitude of the student has little bearing on either success in or attitude toward the telecasts in the Illinois Television Project for the Gifted.

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[1] E. Paul Torrance, Guiding Creative Talent (Englewood Cliffs, N. J.: Prentice-Hall, 1962).

[2] See Table 19 in Appendix M for details.

Independent Study Ability

It was not until part way through the Project that the relevance of the ability of the student to handle independent study situations was fully appreciated. The lessons had been designed for high ability students who could reason, make generalizations, learn and apply concepts, and consider complex relationships. The lessons were produced such that the Project hoped enough interest would be generated to maintain attention during the telecasts. At the same time, the lessons were watched in relatively free atmospheres, often with no teacher present, and no grades were given nor was completion of activities required.

As the Astronomy telecasts continued, some of the teachers began pointing out the inconsistent behavior of some students, with students of equal ability showing clear differences in attention and in work in their Project Books. Obviously the differences were not in ability, nor could the teachers explain the differences in terms of student preferences for various subjects. Part of the difference, it is argued, can be explained by the interest, or willingness, or capability of the student to carry on by himself in a learning situation without external motivation and support. Other studies have found that neither academic ability nor academic success are reliable predictors of success in independent study programs.[1] In some cases, lower ability students have been more successful at independent study than high ability students.[2]

Some attempt to evaluate independent study ability was made by simply asking each teacher or Coordinator to "Rate the student on how capable he is of carrying out independent school study programs under favorable conditions (that is, the degree to which he could maintain his interest and activity and pursue a study with little or no teacher direction and without the motivation of a grade)." The evaluations were made in March and April after the last telecast. The ratings were in terms of (1) below average, (2) average, (3) above average, and (4) superior.

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[1] Winslow R. Hatch and Ann Bennet, "Independent Study," *New Dimensions in Higher Education*, Vol. 1, (OE-50005) (Wash. D.C.: *U. S. Govt. Printing Office, 1960*).

[2] Howard E. Gruber and Morris Weitman, *Self-Directed Study: Experiments in Higher Education* (Boulder, Colo.: *Univ. of Colorado Behavior Research Laboratory Report*, No. 19, 1962).

Table 12 indicates how the teacher ratings of the students on their abilities at independent study related to their ability index based on test scores.

Table 12

Relationship of Independent Study Ability and Academic Ability

Independent Study Ability	%	N	Academic Ability Mean to 1 s.d. Above	 1 s.d. to 2 s.d. Above	 2 or More std. dev. Above
Below Average . .	5	24	8%	6%	0%
Average	26	116	40%	26%	17%
Above Average . .	43	196	44%	44%	39%
Superior	26	117	8%	24%	44%
Total Per Cent			100	100	100
Total N			50	319	84
			chi square = 30.2		p = .001

Table 12 indicates that whatever characteristics the teachers are rating as ability for independent study, these characteristics are related to academic ability. Students rated high by their teachers on independent study ability were also likely to be rated by their teachers as doing well in the television courses (p = .001) and to be rated as over-achievers (p = .001). Sixth graders were more likely to be rated high on independent study ability than fifth grade students (p = .001).

Independent study ability did relate to each of the three achievement tests. But when the effect of academic ability and IQ were partialled out there was no significant relationship between the teacher-rated independent study ability and the achievement tests, nor were those rated high on independent study ability more likely to have worked in their workbooks nor were they more likely to have sent in for one of the mail-in kits.

If success of completion of workbook activities is used as a measure of ability to work independently, the results are somewhat different. Students who completed more workbook pages were more likely to be rated by the teachers as over-achievers (Mathematics series, p = .01), and were rated by the teachers as more successful in the project (Geography and Mathematics, p = .05). In the Astronomy series, students who worked in their Project Books in class also tended to work in them out of class (p = .001), and were more likely to report liking and understanding of the Astronomy series (p = .04). Students who worked in the Geography workbook rated geography as more good (p = .05), more easy (p = .01) more clear (p = .05) and more interesting (p = .05). When the standard set of covariables (IQ, etc.) were partialled out, work in the Project Books was still related to the end-of-course achievement tests. For the Mathematics and Geography viewing groups, work on the Project Books was related to IQ (p = .03). But for the Astronomy viewing group, while work on certain equipment after the class (rangefinder, gnomon,and star charts) was related to IQ (p = .01), work on the Project Book during and after the broadcasts was not related to IQ.

There is an indication in these results that independent study ability as judged by the teachers was not the same as independent study ability as evidenced by actually doing work in an independent study situation.[1] The teachers' judgments were more related to academic ability or IQ than the behavioral evidence. The evidence also suggests that success or activity in the course was related to capabilities for self-directed study even after correcting for differences in academic ability. Additional data would have been necessary to understand more adequately the role of individual differences in capacity for self-directed learning as related to the use of television attempted in the Illinois Television Project for the Gifted.

Results for the High Ability Subsample

One of the objectives of selecting students with a wide range of ability levels for the evaluation of the Illinois Television Project for the Gifted was to allow some generalization about differences in results when different levels of students are involved. The following analysis describes the results for those students categorized as very-high-ability or two or more standard deviations above the mean on achievement and a ability tests. This is the group with IQ's above 132, without regard to being under- or over-achieving, creative,independent, or high classroom performers. The average IQ for this group was 135.

As Table 1 indicated, IQ or ability was related to performance on the achievement test for each series. Table 12 and the subsequent discussion indicated that ability was related to teacher ratings of capacity for independent study, and in some cases was and in some cases was not related to behavioral indicators of working independently. Table 13 indicates the relationship of ability to liking of the Astronomy and Mathematics series. While the relationships are not significant, the figures indicate a direct relationship between ability and liking Astronomy and an inverse relationship between ability and liking Mathematics. These results are consistent with subjective evaluations that Astronomy was the most difficult series. The very high ability student at times found the Mathematics and Geography series "too easy" or "too slow," but the Astronomy series was consistently challenging or difficult. Based on the responses "dull (1) - interesting (7)" to the concepts ASTRONOMY, MATHEMATICS, or GEOGRAPHY, the high ability subsample rated Astronomy most interesting (5.84), Mathematics second (5.74) and Geography third (5.33).

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[1] Gallagher, Analysis of Research on the Education of Gifted Children, pp. 6-10, notes that in identifying the gifted, most authorities agree that teachers' opinions definitely need supplementing with more objective methods.

Table 13

Relationship Between Ability Level and Liking the Astronomy and Mathematics Television Series

	N	Ability Level Index Mean to 1 s.d. Above	 1 s.d. to 2 s.d. Above	 2 or More std. dev. Above
Liked Astronomy	74	63%	64%	79%
Neutral to Astronomy . .	23	12%	24%	12%
Disliked Astronomy . . .	13	25%	12%	9%
N	110	8	78	24
		chi square = 3.61		p = .50
Liked Mathematics	202	76%	69%	68%
Neutral to Mathematics .	48	14%	19%	10%
Disliked Mathematics . .	41	10%	12%	22%
N	291	29	200	62
		chi square = 6.91		p = .15

There were virtually no significant differences among students according to ability level when compared across the various attitude and motivational criteria. Basically, students at all ability levels evaluated the subject and their interest in the subject at about the same level. Table 14 indicates the relationship between ability level and the students' reports of understanding the lessons. There was no significant relationship between ability level and self-reported understanding of the lesson, although the direction of differences again suggests that the Astronomy series was more difficult.

In all three series, there was a slight but significant relationship between ability and working in the Project Books. That is, students of higher ability were more likely to complete more of their Project Book activities. There was no relationship between ability level and sending in for the mail-in kits. At all ability levels, about two-thirds of the students requested a mail-in kit. There was no difference in the kind of kit sent for among ability groups. Nor were there any significant differences in the kind of kit sent for among the highest ability group according to which series they viewed.

Table 14

Relationship Between Ability Level and Reported Understanding of the Astronomy and Mathematics Television Series

		Ability Level Index		
	N	Mean to 1 s.d. Above	1 s.d. to 2 s.d. Above	2 or More std. dev. Above
Understood Astronomy . . .	52	38%	44%	62%
Neutral on Understanding .	31	25%	29%	25%
Did Not Understand Astronomy	27	38%	27%	13%
N	110	8	78	24
		chi square = 3.87		p = .43
Understood Mathematics . .	211	62%	74%	74%
Neutral on Understanding .	54	28%	18%	16%
Did Not Understand Mathematics	26	10%	8%	10%
N	291	29	200	62
		chi square = 2.14		p = .71

Analyses paralleling those reported in Tables 4, 5, and 6 were run using just the very high ability students. The results are indicated in Tables 15, 16, and 17. Comparing the two sets of tables it can be seen that the results are essentially the same, although most of the significant differences between viewers and non-viewers for the total sample became non-significant for the high ability sample. The results shown in Tables 15, 16, and 17 indicate that learning occurred, but that attitude changes did not occur. The direction of attitude differences between viewers and non-viewers is inconsistent for all three courses.

Viewing the lessons produced a 31% improvement in astronomy scores, a 16% improvement in mathematics scores, and an 18% improvement in astronomy and geography tests, but the proportion of test score increase by viewers was less for the high ability subsample than for the total sample. In all cases, however, the high ability groups had higher achievement test scores than the lower ability groups.

Table 15

Analysis of Covariance Results on
Astronomy Post-Telecast Criteria Scores
for High Ability Group

Criterion	Viewers Mean (Unadjusted)	Non-Viewers Mean (Unadjusted)	t Value (Adjusted)
Achievement Test.................	29.28	22.32	5.44**
Number of Science Books Read During Last 30 Days of Series...	0.64	0.12	3.17**
Rank Placement of Subject in Terms of Usefulness.............	6.92	6.28	1.77
Rank Placement of Subject in Terms of Interest...............	6.00	6.48	0.64
Attitude Scale (Thurstone Type)..	7.35	7.49	1.29
Science Activity Index...........	2.82	2.98	1.75
Semantic Differential Scales on Concept ASTRONOMY:			
Good - Bad..........	2.00	1.96	0.38
Clear - Confusing....	3.40	2.48	1.77
Exciting - Calming......	2.64	2.24	1.17
Useful - Useless......	2.00	1.96	0.81
Interesting - Dull.........	2.16	2.00	0.01
Expert - Inexpert.....	3.04	2.32	0.56
Easy - Difficult....	3.40	2.72	1.26
Active - Passive......	2.40	2.84	0.95
Intelligent - Stupid.......	2.04	2.08	1.24

NOTE: N for viewers equals 25; N for non-viewers equals 25.

**Indicates difference significant at .005 level.

Table 16

Analysis of Covariance Results on Mathematics Post-Telecast Criteria Scores for High Ability Group

Criterion	Viewers Mean (Unadjusted)	Non-Viewers Mean (Unadjusted)	t Value (Adjusted)
Achievement Test..................	18.29	15.79	4.25**
Number of Mathematics Books Read During Last 30 Days of Series.........................	0.03	0.00	1.31
Rank Placement of Subject in Terms of Usefulness.............	7.68	8.37	1.95
Rank Placement of Subject in Terms of Interest...............	6.08	6.90	1.02
Attitude Scale (Thurstone Type)..	7.08	6.91	0.99
Semantic Differential Scales on Concept MATHEMATICS:			
Good - Bad..........	1.88	1.74	0.46
Clear - Confusing....	2.55	2.10	0.07
Exciting - Calming......	2.71	2.68	0.55
Useful - Useless......	1.62	1.16	1.68
Interesting - Dull.........	2.26	1.90	0.82
Expert - Inexpert.....	2.45	2.79	0.70
Easy - Difficult....	2.94	2.58	0.25
Active - Passive......	2.45	2.68	1.24
Intelligent - Stupid.......	2.14	1.90	0.16

NOTE: N for viewers equals 65; N for non-viewers equals 19.

**Indicates difference significant at .001 level.

Table 17

Analysis of Covariance Results on Geography Post-Telecast Criteria Scores for High Ability Group

Criterion	Viewers Mean (Unadjusted)	Non-Viewers Mean (Unadjusted)	t Value (Adjusted)
Achievement Test.................	28.24	23.87	2.59*
Number of Social Studies Books Read During Last 30 Days of Series........................	0.02	0.10	1.92
Rank Placement of Subject in Terms of Usefulness.............	5.47	5.52	0.90
Rank Placement of Subject in Terms of Interest...............	4.59	4.84	0.04
Attitude Scale (Thurstone Type)..	6.52	7.09	0.42
Semantic Differential Scales on Concept GEOGRAPHY:			
Good - Bad..........	1.95	2.13	1.42
Clear - Confusing....	2.22	2.68	0.35
Exciting - Calming......	3.19	2.90	0.32
Useful - Useless......	1.64	1.84	2.51*
Interesting - Dull.........	2.67	2.68	1.53
Expert - Inexpert.....	2.72	2.81	0.03
Easy - Difficult....	2.47	3.16	1.94
Active - Passive......	3.10	2.71	0.15
Intelligent - Stupid.......	2.19	2.23	0.64

NOTE: N for viewers equals 58; N for non-viewers equals 31.

*Indicates difference significant at .05 level.

CHAPTER 5

Conclusions and Recommendations

Conclusions

The Illinois Television Project for the Gifted was an attempt to bring into the classroom by television carefully prepared enrichment material suitable for gifted fifth and sixth grade students which would offer enhanced learning situations and motivation for self-directed cognitive activity and learning. These goals were to be achieved with minimal involvement of the classroom teacher. Lessons in astronomy, mathematics, and geography were produced for viewing by students for two half-hours a week without a teacher being present or without a teacher following up on the lessons.

Learning occurred. Students viewing the lessons scored higher on achievement tests than students not viewing the lessons.

The lessons were judged by the teachers to be educationally sound and to contain good teaching elements. Various persons in educational television judged the lessons to be well produced and meaningful. Most of the viewing students reported that they liked the lessons.

However, in spite of generally favorable reaction to the lessons themselves by teachers and viewing students, and in spite of evidence of interest in the lessons and subject areas based on viewers' written responses and behavior, little or no difference in attitude or overt behavior was found between students who viewed any series and students who did not view the series.

These results, the occurrance of significant learning but with little significant attitude effects, were found for the very high ability or gifted student as well as for the slightly above average student. At the same time, it should be remembered that these were group results, and that individual students exhibited all degrees of attitudinal and achievement variations. Similar results were found in the Massachusetts and Maine studies cited in Chapter 1.[1] In both cases, significant learning occurred but little or no positive attitude effects occurred and in some cases even negative attitude effects followed.

It seems probable that one factor operating in the present situation, especially in the case of the Astronomy series, is that the lessons, by challenging the ability of the student and by presenting a somewhat severely realistic view of the professional astronomer, have disaffected the previously held attitudes of the students. The students may have become disenchanted when their somewhat romantic view of science was contradicted by the more realistic view that astronomers must work and think hard and concern themselves with details. Another factor that may have contributed to the lessons' failure to bring about positive attitude shifts in most viewing students was that the lessons represented an addition to the work load of most viewing students, rather than a substitution for other assigned materials.

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[1] Sheehan, op. cit., and Devitt, op. cit.

It can be concluded that when used in the manner and with students similar to those reported on in this Project report, a degree of learning of concepts, abstractions, and generalizations will occur, but only certain individuals will exhibit the positive attitudinal behavior planned for in the original development.

As additional attempts are made to bring special instructional material for gifted children into the schools, several procedures can be suggested to help insure improved results. The material needs to be carefully tailored to the needs of the target audience. Clearly developed behavioral objectives for each lesson or segment are needed before the lesson is produced. A desirable procedure would be to develop short instructional sequences, try them out live in a classroom of children, revise the material on the basis of the student responses, put the sequences together in a videotaped lesson, try out the whole videotaped lesson on a small group of students, revise the material again on the basis of the student responses, and finally videotape the final version of the lesson. This two or three-step development of lessons takes time, but then good teaching does take time. Lesson production teams should accept the need to go through lengthy development sequences. There is no substitute for empirical evaluation. Some attempt to follow such development procedures was made in the present Project, but production deadlines severely limited the amount of try-out and revision that could be accomplished.

The number of lessons in any sequence should be governed by the objectives of the series. Both the Astronomy and Geography series in the present Project could be extended fruitfully for many more lessons. The Elementary-School Science Project, from which the Astronomy series stems, has developed already an extensive curriculum that could be adapted to television lessons for gifted students.

The initiation of an independent study program for elementary school students should be carefully planned. Lessons should be developed that lead students into the process of being responsible for their own learning. It is suggested that abilities for self-directed learning, like abilities in note taking and abilities in small group discussions and team work, can be learned. School programs in the early grades designed to foster self-directed learning in students would enable very profitable use to be made in the intermediate grades of television, programed instruction, and other independent study procedures.

Clearly much more needs to be learned about how students learn and how self-directed learning can be improved. The independent study aspects in the present Project appeared to be just novel enough to many students to inhibit favorable responses. Many able students appeared to hold back and wait for directions rather than to move out and become involved in their learning. Undoubtedly more than one kind of enrichment program for gifted students will be needed to reach all students effectively.

Recommendations

Selection of Viewing Students

The lessons in the Illinois Television Project for the Gifted were developed for gifted fifth and sixth grade students. Based on the student responses to the telecasts and the Coordinators' comments, the following recommendations are made.

The Astronomy series seems most suitable for use in the sixth grade. Very able (gifted) fifth graders and the upper quarter of seventh graders may also profit from the series. When used with a teacher follow-up in the classroom a good number of fifth grade students and most sixth and seventh grade students can learn from the Astronomy series. Because of the difficulty of the material in the Astronomy series and the fairly rapid pace with which it is presented, care should be given in selecting students who are or can be motivated to participate in the lessons. Particularly when using Astronomy in an independent study program, students should be selected who are capable of sustaining self-directed intellectual activity.

The Mathematics series may be viewed profitably by the upper quarter of fifth grade students and the upper half of sixth grade students. The series will generally seem too slow for a seventh grade student. The Mathematics series is not so difficult mathematically, but it does challenge the student to put together answers for himself and to seek new ways of looking at a problem. The gifted child and the student willing to go off on an intellectual tangent will find many suggested paths of inquiry limited only by the student's own capabilities. The usefulness of an in-class teacher for follow-up is less for the Mathematics series than for the other two series, except that the teacher may serve to motivate the students for independent activity.

The Geography series can be recommended for gifted fifth grade students and the upper quarter of sixth grade students when used as an independent study program. Very high ability fourth grade students and most seventh grade students could also benefit from the Geography series, depending on what their social studies and geography curriculum has offered them up to that point. When used with a classroom teacher in the usual team-teaching situation of instructional television, the Geography series is suitable for most fifth and sixth grade students.

In general, the procedure for selecting students to view the lessons will depend on the use or situation intended within the school. More care in selecting students must be taken when they are to view and work by themselves without a teacher in the classroom than when the lessons are used as part of an on-going class with a teacher present. When used as part of an independent study program, criteria in addition to academic ability should be used in selecting students. Thus, in addition to choosing students on the basis of IQ scores above 130 and achievement test placements more than two years ahead of grade, evidence of some ability to initiate and to carry out a self-directed study program should be required. There are, presently, no objective methods by which to choose such students, and teacher judgments of independent study ability will probably have to be used.

It is often assumed that students with strong independence needs will prefer and do better in independent study situations. Gruber and Weitman found positive but slight relationships between the student's regard for independent intellectual work and achievement in independent study and favorable course evaluations under independent study conditions.[1] Koenig and McKeachie, however, found no support for the independence need-independent study success relationship.[2] Koenig and McKeachie did find that students who thought teachers should be authoritarian did poorly in independent study situations. Chickering concluded that the distinguishing characteristics of successful independent students were social, emotional, and attitudinal.[3] Traits characterizing students capable of independent work in Chickering's study were: self-confidence, originality, theoretical orientation, aesthetic interests, interdependence with others (relates to others but not dependent), venturesomeness, resourcefulness, persistence, and reflectiveness.

Methods for Utilization

The independent study program under which the telecasts were viewed during the experimental period called for the students to view the lessons in groups, without a teacher, and to initiate follow-up activities at the student's option during any free time the student could find before the next telecast. It was a very unstructured situation.

Another design for an independent study program using the telecasts from the Illinois Television Project for the Gifted or other ITV series would be to have students get together in small discussion groups of four to six students after each lesson. By partly organizing such groups the students would be able to help each other directly and even to develop team solutions to problems. Little spontaneous intellectual interaction among viewing students was observed during the experimental phase of the Project, and more direct efforts to encourage such interaction should prove fruitful.

Still another procedure that could enhance the use of television lessons in an independent study program would be to provide a teacher-consultant who could visit with the viewing groups occasionally and consult individually with students once or twice each week. The individual sessions could be used both to provide an intellectual and factual resource person and to motivate the performance of the student.

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[1] Gruber and Weitman, op. cit., pp. 23-27.

[2] Kathryn Koenig and W. J. McKeachie, "Personality and Independent Study," Journal of Educational Psychology, 1959, 50, 132-134.

[3] Arthur W. Chickering, "Dimensions of Independence," Journal of Higher Education, 1964, 35, 38-41.

The use of small-group discussions and faculty resource persons could help to offset one of the disadvantages of television - the lack of opportunity for interaction. In any use of the lessons, it is recommended that a ten to twenty-minute period be allowed immediately following each telecast during which time the viewing students may work in their Project Books or talk with each other about the lesson.

Availability of Lessons

The three instructional television series in the Illinois Television Project for the Gifted are available on videotape. Schools and superintendents in Illinois who wish to make use of these lessons should make arrangements through their regional instructional television associations,[1] who in turn can make arrangements for obtaining videotapes with the Office of the Superintendent of Public Instruction. Schools, districts, and superintendents outside of the State of Illinois may obtain videotaped copies of the lessons from the Great Plains Instructional Television Library, Lincoln, Nebraska.[2]

Project Books (workbooks) and Teachers' Guides may be obtained from the University of Illinois Press, Urbana, Illinois 61803. A brochure describing the series and providing an order form for the printed materials also may be obtained from the Press.

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[1] The regional ITV associations are:

Northern Illinois Educational Television Association
Northern Illinois Univ., DeKalb, Illinois 60115
Chicago Area School Television, Inc., c/o Station WTTW
5400 N. St. Louis, Chicago, Illinois 60637
Illinois Valley Instructional Television Association
Bradley Univ., Peoria, Illinois 61606
Midstate Instructional Television Association
Illinois State Univ., Normal, Illinois 61761
Central Illinois Instructional Television Association
Univ. of Illinois, 205 S. Goodwin, Urbana, Illinois 61803
West Central Educational Television Association
Western Illinois Univ., Macomb, Illinois 61455
Eastern Illinois Instructional Television Association
Eastern Illinois Univ., Charleston, Illinois 61920
Southern Illinois Instructional Television Association
Southern Illinois Univ., Carbondale, Illinois 62930

[2] The Great Plains Instructional Television Library, University of Nebraska, Lincoln, Nebraska, is a nonprofit instructional television distribution center. Write to the library for information on rental of the series and to obtain an inspection kit for previewing the series.

APPENDIX A

PRODUCTION OF THE TELEVISED LESSONS

by Stanton W. Saltzman

The thirty-seven programs indicated in this report were produced from January,1964,to June,1965. The production problems encountered changed from section to section and indeed from one lesson to the next. All of the lessons were produced in a studio approximately 26 x 32 feet. The camera equipment used consisted of three General Precision Laboratory image orthicon cameras. Allied equipment included film and slide chains, an Ampex 1000B videotape recorder, a teleprompter,and other studio equipment.

In order to eliminate copyright problems all graphic materials used were constructed by the studio staff. All 2 x 2 slides were either the property of the instructors, taken specifically for the Project by the studio staff, or purchased from commercial sources with written permission to use. The films used in portions of lessons were either rented (with written permission to duplicate on videotape) or donated by a particular source (such as the National Aeronautics and Space Administration) or made specifically for the Project by the studio staff.

The title music was written by a graduate student in the school of music and is the property of the University of Illinois.

The production techniques differed in all three subject areas. Each of the Astronomy lessons used a basic starting point for the instructor to begin the lesson. There were a number of other areas set in the studio so that movement even in a rather small area could be accomplished. Since the scripts were highly formalized and written by someone other than the on-camera instructor, a teleprompter was used to allow freer movement and to avoid script memorization. All of the lessons in Astronomy and Geography were rehearsed twice before the final taping. The first rehearsal consisted of a walk through for familiarization of the studio crew and to give the instructor an opportunity to work with the teleprompter and visual materials. The second rehearsal took the form of a dress rehearsal during which the lesson was timed and any final changes were made. The same procedure was followed in the Geography series with the exception of the use of the teleprompter, since the geography instructor wrote his own scripts.

The Mathematics series was not scripted in the normal sense of writing down words and indications of visual materials. Three areas were used in the studio and these areas in themselves were visuals. A simple run-down sheet was used to indicate when the instructor would move from one area to another. During the initial walk through, the shooting pattern was decided upon and problems solved. Since the Mathematics lessons were sequentially arranged, a timing rehearsal was unnecessary. It was also possible to produce more than one Mathematics lesson in a single production session, thereby reducing production costs.

The original production schedule planned for taping two lessons per week. Because of other commitments, re-makes, changes in visual materials, etc., a more realistic taping schedule was adopted. Scheduling the initial taping session for the early part of the week enabled the Project staff to evaluate and make any changes necessary at the end of the same week.

An attempt was made to have all scripts and visual materials prepared well in advance of the first taping session. This proved to be a bit ambitious, but the staff was able to keep well in front of the proposed date for taping.

APPENDIX B

BROADCAST AND TEST SCHEDULE

Week of	Event
Sept. 12	Coordinators' meeting
Sept. 21	STEP Science test, questionnaire #1
Sept. 28	Henmon-Nelson Ability test, questionnaire #2
Oct. 5 - Nov. 12	Astronomy broadcast period
Nov. 16	STEP Mathematics test, questionnaire #3
Nov. 23	Astronomy test, questionnaire #4
Nov. 30 - Dec. 17	Mathematics broadcast period, part 1
Dec. 12	Coordinators' meeting
Jan. 4 - Jan. 21	Mathematics broadcast period, part 2
Jan. 25	STEP Social Studies test, questionnaire #5
Feb. 1	Mathematics test, questionnaire #6
Feb. 8 - Mar. 18	Geography broadcast period
Mar. 15	Coordinators' meeting
Mar. 29	Geography test, questionnaire #7
April 28	Gilman, Illinois, demonstration-conference
May 15	Conference on Programs for Education of the Gifted
May 20	Flora, Illinois, demonstration-conference

Broadcast days were Monday and Thursday, 9:30 a.m. - 10:00 a.m.

APPENDIX C

AGENDAS FOR DEMONSTRATION CONFERENCES

Demonstration Conference No. 1

Wednesday, April 28, 1965, Gilman High School

2:30 p.m.	The Illinois Television Project for the Gifted: Introduction and explanation
2:45 p.m.	Playback of sample television lesson: (Selected fifth and sixth grade students will be present to view the telecast)
3:15 p.m.	Discussion period with viewing students
3:30 p.m.	Summary of the Illinois Television Project for the Gifted, and discussion of other potential uses of television in a program for gifted students
3:45 p.m.	Discussion with Roger Marcum, Director, Gifted Project, Urbana School District #116, on other possibilities for programs for the gifted under state support
4:20 p.m.	Question period
4:30 p.m.	Adjournment

Demonstration Conference No. 2

Thursday, May 20, 1965, McEndree School, Flora

2:30 p.m.	The Illinois Television Project for the Gifted: Introduction and explanation - James D. Hennes, Project Director
2:45 p.m.	Playback of sample television Lesson. (Selected fifth and sixth grade students will be present to view the telecast)
3:15 p.m.	Discussion period with viewing students
3:30 p.m.	Summary of the Illinois Television Project for the Gifted, and discussion of other potential uses of television in a program for gifted students
3:45 p.m.	Discussion with Douglas Paulson, Consultant for the Illinois Department of Program Development for Gifted Children, on other possibilities for programs for the gifted under state support
4:20 p.m.	Question period
4:30 p.m.	Adjournment

A CONFERENCE ON PROGRAMS FOR EDUCATION OF THE GIFTED

Sponsored by: Illinois Television Project for the Gifted; Central Illinois Instructional Television Association; Office of Instructional Resources, University of Illinois; Department of Program Development for Gifted Children in the Office of the Superintendent of Public Instruction.

FRIDAY, MAY 14, 1965

Visitation day to area schools conducting demonstration programs in the Illinois Plan for the Gifted. Schools may be visited by contacting the school directly: North Ridge Junior High School, Danville; Champaign Community Unit 4; Lakeview High School, Decatur; Urbana Community School District 116.

SATURDAY, MAY 15, 1965

Illini Union - University of Illinois - Urbana

9:15 Welcome and Introduction

9:20 Keynote Address: Challenges to the Self-Contained Classroom
Dr. William Rogge, Supervisor, Illinois Demonstration Center Program, Research Assistant Professor of Education, University of Illinois

10:00 Coffee Break

10:25 Identifying the Gifted Child
G. Edward Stormer, Consultant, Quincy Demonstration Center

11:00 Creativity and Giftedness
Mrs. Veda Larson, Consultant for the Gifted, Champaign Unit 4 Schools

11:45 Lunch, Room 314a Illini Union
Speaker: Charles V. Mathews, Director, Delinquency Study Project, Southern Illinois University, Edwardsville
Topic: Education for the Culturally Underprivileged

1:15 Illinois Television Project for the Gifted -- Status and Future
James Hennes, Project Director, University of Illinois

1:45 The Illinois Plan for the Gifted -- Status Report and Reimbursement Procedures, Herbert Baker, Assistant Director, Department of Program Development for Gifted Children, Office of the Superintendent of Public Instruction

2:15 Group discussion with state gifted consultants on what might be done in your school and how the state might be able to help.
Consultants Miss McCoy, Mr. Paulson, Mr. Coombs and Mr. House

3:00 Trends in Programs for Educating the Gifted
Dr. James J. Gallagher, Professor of Special Education, Associate Director of Institute for Research on Exceptional Children, University of Illinois

3:30 Adjournment

APPENDIX D

SAMPLE PAGES: ASTRONOMY AND GEOGRAPHY SCRIPTS

Astronomy: Lesson #10

Did you have some clear nights for stargazing since our last lesson? Fortunately, I did -- and I took a camera along to record my observations. If you have any notes or sketches of your observations, you can check them now with what the camera recorded. If you've been having cloudy nights and haven't been able to do any star watching, our star photographs will give you a good idea of what was going on up there beyond the clouds.

Let's begin with a star in the eastern sky. There are lots of stars to choose from, and I probably picked a different one. That won't matter, though, since all the stars appear to move in the same general way.

SLIDE 1 - Star (or stars) in eastern sky (time exposure of at least one hour, preferably 2 hours)

[VOICE OVER]
This star photograph was taken early in the evening, with the camera pointing up above the eastern horizon. The camera was set for a time exposure, and the shutter was left open for _____ hour(s). So the motion of a star appears as a tiny streak of light. Since this picture is of the eastern sky, which side of the picture represents north? --- The lefthand side. Which way does our eastern star appear to move? --- Toward the south and up. Both the bearing and elevation of the star are increasing.

Changing Patterns of Population and Functions Within the City

Geography: Lesson #11

NEWSPRINT #1 - Growth of Lake City, U.S.A.

Hello. When you examined this map on page 77 in your Project Book, showing the patterns of growth for Lake City between 1825 and 1960, were you able to decide from which direction the first settlers came?

a. They probably came from the east, didn't they?

(1) Why did you say this? -- Because the first settlement grew up on the east side of Indian River.

(2) Did the first settlers arrive by water or by land? -- The first settlers probably arrived by water, although many of the early people could have reached the site of Lake City in wagons over Indian trails.

b. Did you select No. 5 and No. 2 as being the first railroad tracks into and out of Lake City? Do you see why? -- Note the bulge in the pattern of growth between 1840 and 1880.

c. After what year was the railroad bridge built across Indian River? -- 1880.

d. Did you discover what happened to the physical pattern of Lake City after 1930?

(1) Hilly land developed.

(2) Filled in areas between rail lines.

(3) Consumed more land between 1920 and 1960 than in any other 40-year period.

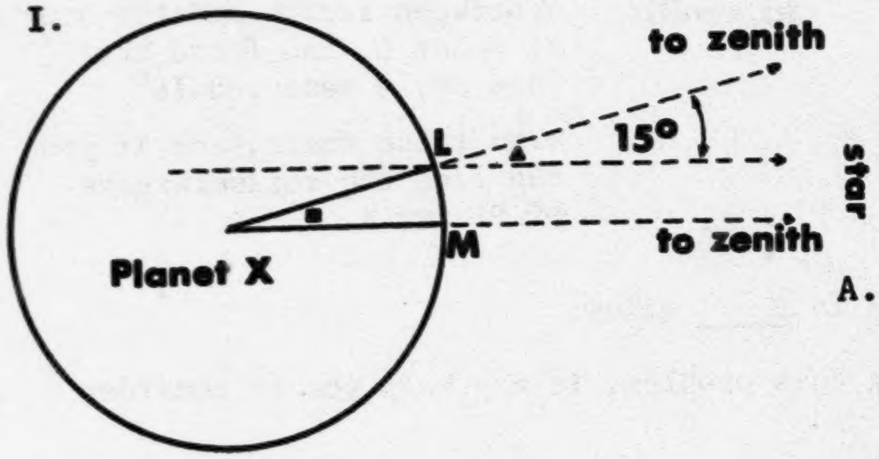
APPENDIX E

SAMPLE PAGES FROM PROJECT BOOKS

Astronomy: Programed Version

ASTRONOMY - Lesson #2

I.



The distance from point L to point M on planet X is 60 miles. Bill found that a star was directly overhead at point M at 6 p.m. At the same hour Kay measured the angle between zenith and the star at point L.

A. Look at the diagram. What is the size of the angle between zenith and the star at point L (angle▲)?

Your answer should be 15°.

B. Now calculate the circumference of planet X. What is your answer?

1. If your answer is 1440 miles

Correct. Good work. Go on to Problem II.

2. If your answer is about 25,000 miles

That's the circumference of the earth. You can do better.

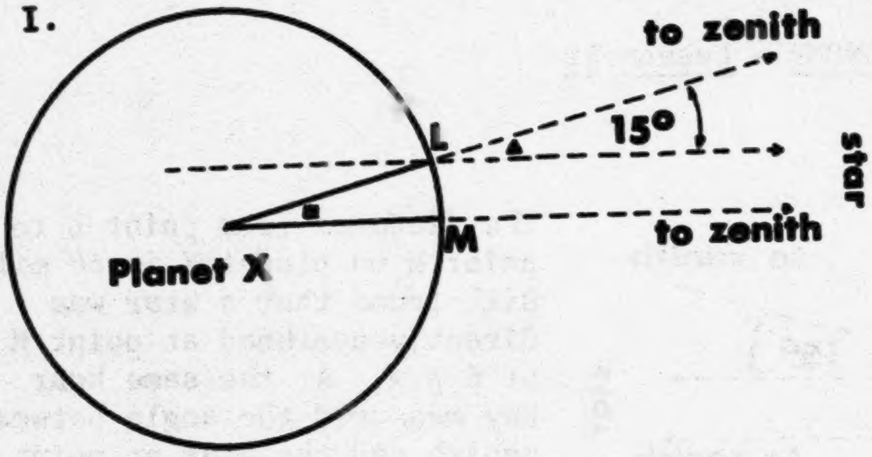
3. If you get any other answer or if you can't answer

Consider the problem in steps. Turn the page.

Astronomy: Revised Version

ASTRONOMY - Lesson #2

I.



The distance from Point L to Point M on planet X is 60 miles. Bill found that a star was directly overhead at Point M at 6 p.m. At the same hour Kay measured Angle Δ between zenith and the star at Point L, and found that this angle measured 15°.

With these facts, see if you can find the circumference of Planet X.

The circumference of Planet X is _____ miles.

If you had trouble in solving this problem, it may help you to consider it in the following steps:

1. You already know that the distance between Point L and Point M is 60 miles. In order to find the circumference, or distance around, Planet X, you need to know what fraction of the total circumference this 60 miles represents. How can you find this out?

   IF YOU COULD DETERMINE THE SIZE OF ANGLE □, YOU COULD FIND OUT WHAT FRACTION OF THE CIRCUMFERENCE IS CONTAINED IN THE 60 MILES BETWEEN POINT L AND POINT M.

2. How can you determine the size of Angle □? You could measure it with your protractor, but are you sure that this is a scale drawing? What other method could you use?

   DO YOU REMEMBER THE WORK YOU DID ON PAGE 3 WITH THE ANGLES FORMED BY A DIAGONAL CROSSING TWO PARALLEL LINES? ARE THE TWO LINES ON THE DRAWING THAT POINT TO THE STAR PARALLEL? IF THEY ARE, WHAT RELATIONSHIP WOULD ANGLE □ HAVE TO ANGLE Δ ? DOES THIS RELATIONSHIP HELP YOU TO DETERMINE THE SIZE OF ANGLE □ ?

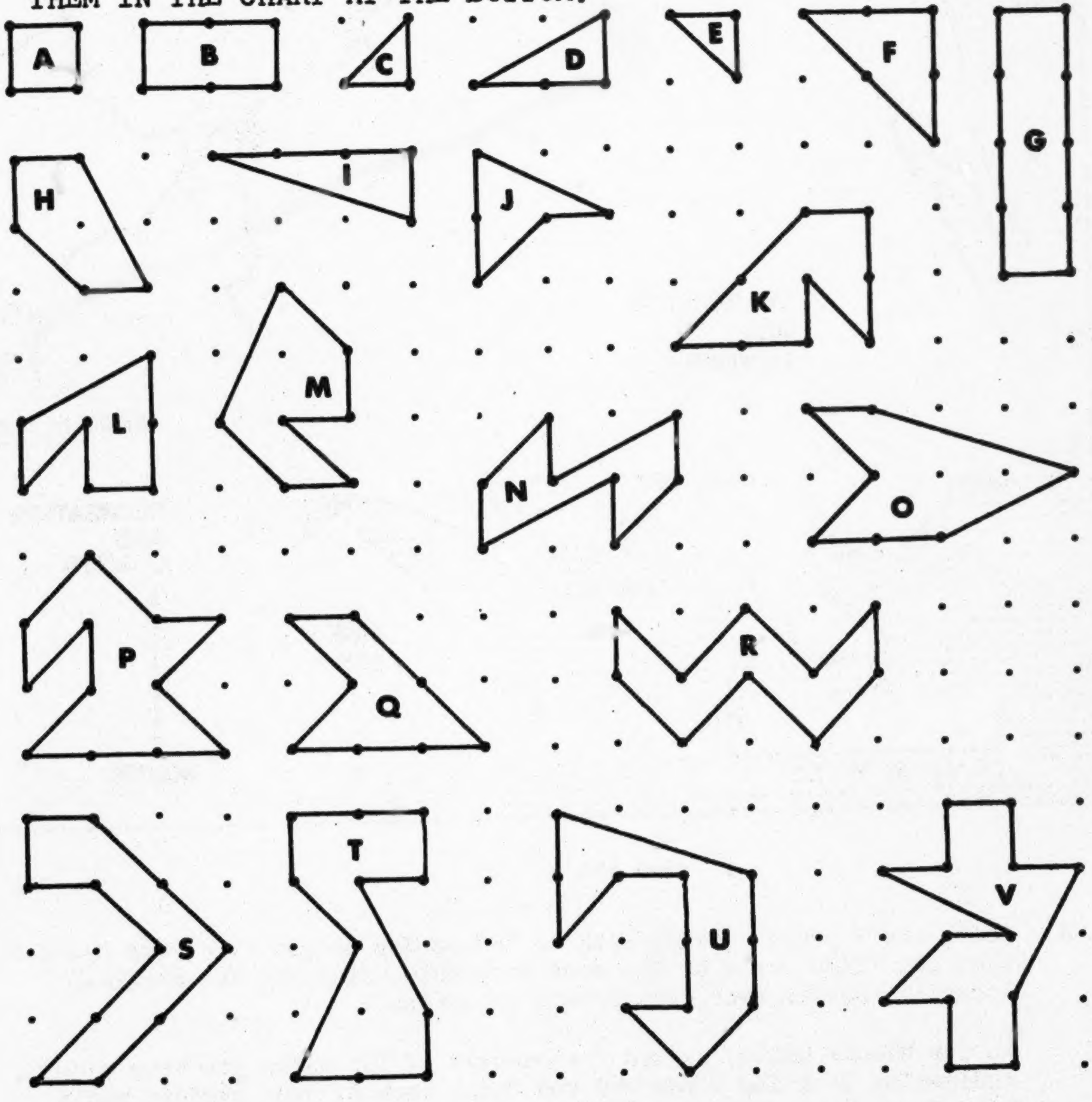
3. How many degrees are represented in the entire circumference of Planet X? How many times will Angle □ fit into the 360° represented by the entire circumference?

4. If you know how many times Angle □ will fit into 360°, then you can multiply 60 miles times your answer to find the circumference of Planet X. Record your answer in the blank above.

MATHEMATICS

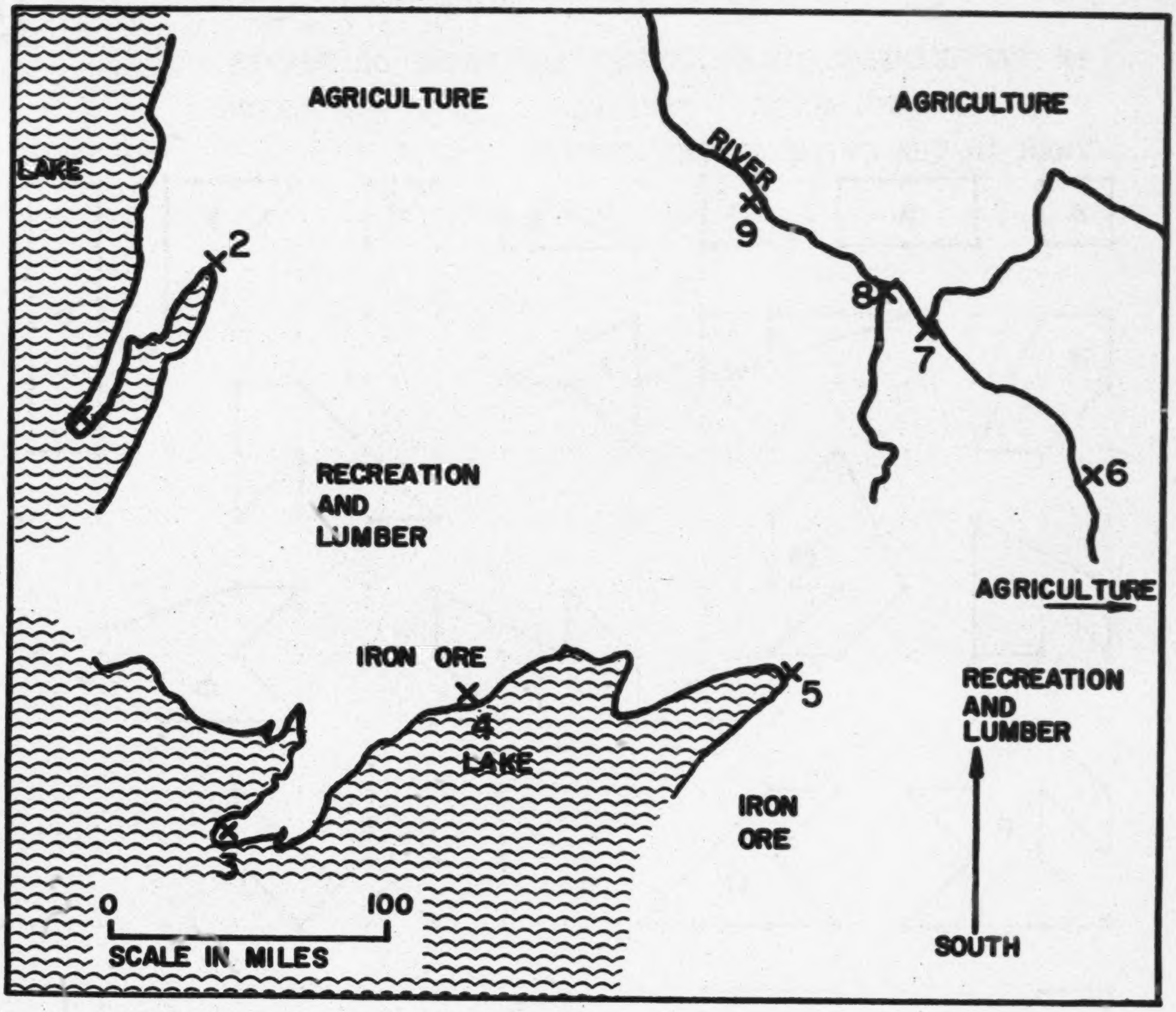
I

IN THE EXAMPLES BELOW, THERE ARE PAIRS OF SHAPES WITH THE SAME AREAS. FIND THESE PAIRS AND RECORD THEM IN THE CHART AT THE BOTTOM.



NUMBER OF SQUARE UNITS	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	$5\frac{1}{2}$
FIGURES WITH GIVEN NUMBER OF SQUARE UNITS OF AREA											

GEOGRAPHY


LAKE
AGRICULTURE
RIVER
AGRICULTURE
2
9
8
7
RECREATION AND LUMBER
6
AGRICULTURE
IRON ORE
4
5
LAKE
3
RECREATION AND LUMBER
IRON ORE
0
100
SCALE IN MILES
SOUTH

MAP # I

A. Among the 9 places marked with an "x" on Map #1 above, circle the 4 that you think would be the most favorable sites for the original location, development, and growth of cities.

In the blanks below, record the numbers of the sites you have chosen, indicating in a few words why you think each of your choices would be a favorable location for a city.

Site # ____. Why? ____

Site # ____. Why? ____

Site # ____. Why? ____

Site # ____. Why? ____

APPENDIX F

THURSTONE ATTITUDE SCALES

An attitude scale of the Thurstone type was adapted from two published scales used in mathematics research projects.[1] In a Thurstone scale a number of items are ranked by judges from 1 through 11. The average ranking of each item is the scale value for that item. Because of the great similarity in scale rankings and item structure of the two original scales, the two scales were combined and items selected which would be suitable for use with subject areas of science and geography as well as mathematics. The original scale value was retained and no further scale evaluation was made.

The scales asking for evaluations of the subjects science, mathematics, and geography were administered to the students before and after each series. The three scales are reproduced on the following pages, along with the scale value for each item and the per cent of all subjects agreeing with each item before the telecasts. The median number of items agreed to on each administration was 11. Table 18 indicates the means and standard deviations for each scale based on the before-telecast administration.

Table No. 18

Means and Standard Deviations for Attitude Scales

Scale	Mean	Standard Deviation
Science	7.13	1.28
Mathematics	6.89	1.51
Astronomy	6.75	1.30

---

[1] Wilbur H. Dutton, "Attitudes of Junior High School Pupils Toward Arithmetic," The School Review, Vol. 64 (1956), pp. 18-22; and Charles Van Horn and Max Beberman, A Study to Determine the Relative Effectiveness of the Use of a Series of Filmed Demonstrations in Teacher Education for a New High School Mathematics Curriculum (NDEA Title VII, Project No. 158) (Urbana, Ill.: University of Illinois Committee on School Mathematics, no date).

HOW DO YOU FEEL ABOUT SCIENCE?

We want to know if you agree or disagree with each of the statements below. Read each statement carefully. If you feel that the statement is true or if you agree with it, CIRCLE THE A NEXT TO THE STATEMENT. If you feel that the statement is false or if you disagree with it, CIRCLE THE D NEXT TO THE STATEMENT. Be sure to mark a response, either D for disagree or A for agree, for each and every statement even if you are not sure how you feel. DON'T LEAVE ANYTHING OUT. WE NEED YOUR FRANK, PERSONAL OPINION.

Item Number	Scale Value	Percent Agreeing	
1	9.0	90	I would like to know more about science than I do.
2	3.0	5	I can't see much value in science.
3	6.5	88	I enjoy doing science problems when I know how to work them well.
4	10.0	58	Science homework is fun to do.
5	5.5	56	I am not enthusiastic about science, but I have no real dislike for it either.
6	7.5	75	Some parts of science are pretty bad, but on the whole I like it.
7	1.0	3	I detest science and avoid it at all times.
8	6.0	89	Science is as important as any other subject.
9	11.0	27	I would rather study science than any other subject.
10	9.0	51	I would like to spend more time in school working on science.
11	1.5	8	I have never liked science.
12	10.0	69	I look forward to science class.
13	2.0	8	I don't understand how people can like science.
14	10.5	31	I think science is the most enjoyable subject I have had.
15	7.0	68	I sort of like science.
16	4.5	40	I don't think science is fun, but I always want to do well in it.
17	8.0	59	I know of only two or three subjects that I like better than science.
18	1.0	2	Science isn't of any value and I don't intend to study it.
19	6.0	73	I like science, but I like other subjects just as well.
20	4.0	41	I don't feel sure of myself in science.
21	8.0	88	Science is very interesting.
22	3.5	65	Science is something you have to know even though it is not enjoyable.

HOW DO YOU FEEL ABOUT MATHEMATICS?

We want to know if you agree or disagree with each of the statements below. Read each statement carefully. If you feel that the statement is true or if you agree with it, CIRCLE THE A NEXT TO THE STATEMENT. If you feel that the statement is false or if you disagree with it, CIRCLE THE D NEXT TO THE STATEMENT. Be sure to mark a response, either D for disagree or A for agree, for each and every statement even if you are not sure how you feel. DON'T LEAVE ANYTHING OUT. WE NEED YOUR FRANK, PERSONAL OPINION.

Item Number	Scale Value	Percent Agreeing	
1	9.0	88	I would like to know more about mathematics than I do.
2	3.0	3	I can't see much value in mathematics.
3	6.5	89	I enjoy doing mathematics problems when I know how to work them well.
4	10.0	54	Mathematics homework is fun to do.
5	5.5	52	I am not enthusiastic about mathematics, but I have no real dislike for it either.
6	7.5	74	Some parts of mathematics are pretty bad, but on the whole I like it.
7	1.0	2	I detest mathematics and avoid it at all times.
8	6.0	89	Mathematics is as important as any other subject.
9	11.0	24	I would rather study mathematics than any other subject.
10	9.0	46	I would like to spend more time in school working on mathematics.
11	1.5	6	I have never liked mathematics.
12	10.0	64	I look forward to mathematics class.
13	2.0	5	I don't understand how people can like mathematics.
14	10.5	24	I think mathematics is the most enjoyable subject I have had.
15	7.0	61	I sort of like mathematics.
16	4.5	46	I don't think mathematics is fun, but I always want to do well in it.
17	8.0	64	I know of only two or three subjects that I like better than mathematics.
18	1.0	2	Mathematics isn't of any value and I don't intend to study it.
19	6.0	72	I like mathematics, but I like other subjects just as well.
20	4.0	30	I don't feel sure of myself in mathematics.
21	8.0	78	Mathematics is very interesting.
22	3.5	80	Mathematics is something you have to know even though it is not enjoyable.

HOW DO YOU FEEL ABOUT GEOGRAPHY

We want to know if you agree or disagree with each of the statements below. Read each statement carefully. If you feel that the statement is true or if you agree with it, CIRCLE THE A NEXT TO THE STATEMENT. If you feel that the statement is false or if you disagree with it, CIRCLE THE D NEXT TO THE STATEMENT. Be sure to mark a response, either D for disagree or A for agree, for each and every statement even if you are not sure how you feel. DON'T LEAVE ANYTHING OUT. WE NEED YOUR FRANK, PERSONAL OPINION.

Item Number	Scale Value	Percent Agreeing	
1	9.0	88	I would like to know more about geography than I do.
2	3.0	7	I can't see much value in geography.
3	6.5	86	I enjoy doing geography problems when I know how to work them well.
4	10.0	47	Geography homework is fun to do.
5	5.5	59	I am not enthusiastic about geography, but I have no real dislike for it either.
6	7.5	71	Some parts of geography are pretty bad, but on the whole I like it.
7	1.0	4	I detest geography and avoid it at all times.
8	6.0	79	Geography is as important as any other subject.
9	11.0	12	I would rather study geography than any other subject.
10	9.0	41	I would like to spend more time in school working on geography.
11	1.5	10	I have never liked geography.
12	10.0	55	I look forward to geography class.
13	2.0	6	I don't understand how people can like geography.
14	10.5	17	I think geography is the most enjoyable subject I have had.
15	7.0	71	I sort of like geography.
16	4.5	56	I don't think geography is fun, but I always want to do well in it.
17	8.0	67	I know of only two or three subjects that I like better than geography.
18	1.0	3	Geography isn't of any value and I don't intend to study it.
19	6.0	80	I like geography, but I like other subjects just as well.
20	4.0	34	I don't feel sure of myself in geography.
21	8.0	80	Geography is very interesting.
22	3.5	74	Geography is something you have to know even though it is not enjoyable.

APPENDIX G

SAMPLE SEMANTIC DIFFERENTIAL PAGE

THE TELEVISION COURSE ON MATHEMATICS

Good___:___:___:___:___:___:___Bad

Confusing___:___:___:___:___:___:___Clear

Exciting___:___:___:___:___:___:___Calming

Low standards___:___:___:___:___:___:___High standards

Useful___:___:___:___:___:___:___Useless

Dull___:___:___:___:___:___:___Interesting

Expert___:___:___:___:___:___:___Inexpert

Difficult___:___:___ ___:___:___:___Easy

Active___:___:___:___:___:___:___Passive

Stupid___:___:___:___:___:___:___Intelligent

APPENDIX H

SCIENCE ACTIVITY SCALE

The science activity scale was adapted from the Reed Science Interest Inventory.[1] The original instrument was a 70-item scale designed to tap information concerning pupils' science activities and has been reported as having a split-half reliability of .97. The original inventory contained items in the broad categories of general science, field and woods, tinkering, thinking about science, verbal activities in science, and behavioral-physiology-home economics science. The verbal science category was dropped for the present study and 40 items were selected to balance the response categories.

Responses to each item were from 1 to 5, indicating the frequency with which an activity had been undertaken. Scores were obtained by summing the responses over items and dividing by the number of items answered. This gave an average item response in the range 1-5. The mean response for subjects was 2.84 in November after the Astronomy telecasts and 2.73 in September before the Astronomy telecasts. The standard deviation was .78. The correlation between the September and the November scores was .74 which can be considered a test-retest reliability over three months.

The science activity scale, which was labeled "Things I Have Done," is presented on the following pages along with the item means for three groups: the total sample, the very high ability group, and the group rated high on their capacity to handle independent study programs.

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[1] Horace B. Reed, "Implications for Science Education of a Teacher Competence Research," Science Education, Vol. 46 (1962), pp. 473-486, and William W. Cooley and Horace B. Reed, "The Measurement of Science Interests: An Operational and Multidimensional Approach," Science Education, Vol. 45 (1961), pp. 320-326.

THINGS I HAVE DONE

We want to know how often you have done the science activities listed below during the past six months. That is, show how often you have done these things VOLUNTARILY, BECAUSE YOU WERE INTERESTED, DURING THE LAST SIX MONTHS. Of course, no pupil does all the things listed.

ANSWER EACH ITEM BY PLACING IN THE SPACE TO THE LEFT OF THE ITEM THE NUMBER OF THE ANSWER YOU CHOOSE ACCORDING TO THIS CODE:

1 = I have NEVER done this thing
2 = I have ALMOST NEVER done this thing
3 = I have done this thing A FEW TIMES
4 = I have OFTEN done this thing
5 = I have VERY OFTEN done this thing

Mean Response				
Total Sample	High Ability Group	High Capability for Independent Study Group		
3.04	3.14	3.12	1.	Read newspaper articles concerning scientific things, because I like to.
2.39	2.51	2.42	2.	Spent my own money for scientific things.
1.82	1.93	1.96	3.	Built or repaired radio sets or other electronic equipment, because I am interested.
2.93	2.90	2.96	4.	Tried to predict the weather from clouds, temperature, and other signs.
3.32	3.37	3.31	5.	Made extra drawings of animals or plants.
2.43	2.83	2.63	6.	Used a home chemistry set.
3.05	2.98	3.02	7.	Worked on a rock collection or tried to figure out reasons for local land formations.
3.13	3.41	3.12	8.	Read Popular Science, Popular Mechanics, National Geographic, or other science magazines because I like to.
2.93	3.12	3.03	9.	Attempted to work out inventions.
2.54	2.82	2.62	10.	Tried to find out about the lives of scientists.
3.54	3.52	3.45	11.	Watched science programs on TV.

THINGS I HAVE DONE (continued)

1 = NEVER 2 = ALMOST NEVER 3 = A FEW TIMES 4 = OFTEN 5 = VERY OFTEN

Mean Response				
Total Sample	High Ability Group	High Capability for Independent Study Group		
2.66	2.83	2.70	12.	Talked with adults about science, because I am interested.
2.48	2.67	2.65	13.	Used a microscope at home.
2.91	3.05	3.10	14.	Did extra reading about inventions.
2.46	2.60	2.51	15.	Talked with fellow students about scientific topics, because I am interested.
3.18	3.37	3.26	16.	Tried to find out about the science of space travel.
3.21	3.22	3.24	17.	Tried to find out about such things as earthquakes, volcanoes, mountains, rivers, or deserts.
2.60	2.72	2.64	18.	Spent time with a friend because we are both interested in science.
3.42	3.65	3.67	19.	Thought about problems like how the earth, the sun, the stars, or life came to be.
3.14	3.18	3.08	20.	Tried to find out about fish and other sea life.
2.83	3.04	2.81	21.	Experimented at home with things dealing with heat, sound, or light.
1.89	1.89	1.73	22.	Tried to find out about how science can help in raising children.
3.18	3.07	3.20	23.	Observed and studied wild animal and bird life, because I like to.
3.03	3.15	3.10	24.	Did extra reading about the way different parts of the human body work.
3.31	3.66	3.47	25.	Thought about such questions as "What is time?" "What is gravity?" "What is space?" "What is energy?"
2.71	2.54	2.74	26.	Worked on a collection of insects, bird nests, or other animal specimens.
3.28	3.44	3.48	27.	Tried to find out about the moon, sun, planets, or stars.

THINGS I HAVE DONE (continued)

1 = NEVER 2 = ALMOST NEVER 3 = A FEW TIMES 4 = OFTEN 5 = VERY OFTEN

Mean Response			
Total Sample	High Ability Group	High Capability for Independent Study Group	
2.79	3.00	2.86	28. Visited a science museum because I like to.
2.70	2.65	2.68	29. Collected parts of plants such as leaves and flowers, because I am interested.
1.71	1.73	1.74	30. Repaired electric lamps and cords, because I like to.
3.11	3.23	3.16	31. Did extra reading about unusual places and people in the world.
2.99	3.01	2.98	32. Went on nature exploring trips because I like to.
2.80	3.05	2.91	33. Tried to find out about the history of scientific discoveries.
2.28	2.35	2.18	34. Tried to find out how science is used in cooking.
3.07	3.30	3.14	35. Looked over the science books in libraries.
2.31	2.58	2.46	36. Made extra science models and equipment.
2.95	2.94	2.91	37. Tried to find out about national parks and wildlife areas.
2.71	2.79	2.63	38. Used field glasses or binoculars to study nature.
3.32	3.21	3.30	39. Went to the movies to see science pictures of wild life such as Disney makes.
2.73	2.85	2.84	40. Tried to find out about the science of nutrition and how the body uses food.

APPENDIX I

CREATIVITY TESTS

The creativity tests were adapted from Torrance.[1] The first, an unusual uses tasks, is called the Tin Cans Test and elicits verbal "creative" responses to verbal stimuli. The task was presented to the students as follows:

UNUSUAL USES

> We want you to think of some UNUSUAL USES OF TIN CANS. List below the cleverest, most interesting, and most unusual uses you can think of for tin cans. The tin cans may be of any size and you can change them in any way they can be changed. YOU WILL HAVE 5 MINUTES TO MAKE YOUR LIST OF UNUSUAL USES OF TIN CANS.

Three scores of a divergent thinking nature were to be obtained by hand coding the responses. The first score, fluency, was simply the count of the number of relevant responses. The second, flexibility, was the count of the number of different categories used. The categorization of responses was extremely difficult. In the present study analysis, time ran out before flexibility could be scored completely, and so no flexibility scores are reported. A rough coding of flexibility can be obtained by coding:

1 = all similar responses
2 = more than one category
3 = a great many variations

A more specific set of categories developed during the coding was: clothing; container for food; container for objects foreign to original contents; glass or dipper; standard tin can toys; games where can is unchanged; noisemakers; use of can as metal rather than can (armor, head band); tool or instrument; sophisticated scientific toys (robots); building units (pipe); device for counting; models; floats.

The third creativity score obtained from the unusual uses task was originality. Originality is a count of the number of truly uncommon responses. Responses in the area of containers, dippers, pots, noise makers, and recreation were not considered original unless the use was really surprising, unusual, heretofore unheard of, etc. The originality scores were running very low, so finally the coding was changed to 1 = no original responses, 2 = 1 original response, and 3 = more than one original response.

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[1] E. Paul Torrance, op. cit.

A fourth score sometimes obtained from an unusual uses task, although not scored in the present project, is a variability score which measures the number of times responses change to a different category. Thus, responses in categories AAABA would count as two changes (from A to B and back to A).

The second creativity test was a creative activities check list. Called THINGS DONE ON YOUR OWN, the check list provided a simple count of the number of creative activities undertaken. Analyses of kinds of activities can be made but were not undertaken in this project. The mean response on the 53 item check list for all subjects was 17.8 with two-thirds of the subjects scoring between 8 and 26. On the following pages the check list is given, along with the per cent of students who checked the item for the total sample, the subsample of very high ability students, and the subsample of students rated as high in their ability to do independent study work. The mean creativity score for the high ability group was 18.2 and the mean creativity score for the independent study group was 18.0.

Table 19

Correlations Between Creativity Scores and Various Criteria Scores

	Creative Activity	Fluency	Originality
IQ	-.07	.06	.02
Ability Index	.00	.05	.03
Independent Study Ability Index	-.04	.03	-.01
Astronomy Test	-.03	.09	.08
Mathematics Test	.01	-.01	.06
Geography Test	-.12*	-.02	.09*
Science Activity Scale . . .	.21*	.07	.01
Science Attitude Scale . . .	.13*	.06	.02
Mathematics Attitude Scale .	.11*	-.06	-.02
Mathematics - Interesting .	.06	.02	.00
Geography Attitude Scale . .	.10*	-.08	-.04
Geography - Interesting . .	.10*	.02	-.06

*Significant at .05 level or better.

THINGS DONE ON YOUR OWN

Below is a list of activities boys and girls sometimes do on their own. Indicate which ones you have done during this fall and winter by checking the blank at the left. That is, put a check (✓) in the space to the left of each activity you have done this fall or winter. Include only the activities you have done ON YOUR OWN, not the things you have been assigned or made to do.

	Per Cent Checking			
Total Sample	High Ability Group	High Capability for Independent Study Group		
54	55	54	1.	Wrote a poem.
53	56	53	2.	Wrote a story.
14	16	14	3.	Wrote a play.
16	16	13	4.	Produced a puppet show.
27	29	26	5.	Kept a diary for at least a month.
37	41	42	6.	Wrote a song or jingle.
70	74	74	7.	Found errors in fact or grammar in newspapers or other printed matter.
42	44	41	8.	Acted in a play or skit.
42	40	46	9.	Made up and sang a song.
54	52	54	10.	Made up a new game and taught it to someone else.
32	32	27	11.	Acted out a story with others.
15	20	17	12.	Made up an original dance.
11	11	11	13.	Explored a cave.
62	61	60	14.	Mixed colors.
17	21	19	15.	Grew crystals.
26	17	31	16.	Made a leaf collection.
6	3	4	17.	Made a wildflower collection.
17	12	12	18.	Dissected an animal.
73	75	74	19.	Used a magnifying glass.
17	18	20	20.	Made ink.
29	35	31	21.	Started a fire with a lens.
84	88	85	22.	Used a magnet.

THINGS DONE ON YOUR OWN (continued)

Per Cent Checking			
Total Sample	High Ability Group	High Capability for Independent Study Group	
13	12	16	23. Raised rats, mice, rabbits, or guinea pigs.
24	21	23	24. Collected insects.
59	57	56	25. Collected rocks.
17	16	15	26. Kept a daily record of weather.
33	30	36	27. Been a bird watcher.
52	68	58	28. Produced static electricity.
40	38	39	29. Constructed a model airplane.
32	30	29	30. Counted annual rings in a log.
32	34	39	31. Made a stamp collection.
7	6	6	32. Made a collection of post marks.
56	59	53	33. Organized or helped to organize a club.
49	50	53	34. Served as officer in a club organized by boys and/or girls.
43	45	45	35. Figured out a way of improving a game we play at school or home.
53	54	49	36. Figured out a way of improving the way we do something at home.
13	12	11	37. Helped act out some historical event.
45	41	46	38. Solved a problem about getting along with other boys and girls.
28	25	33	39. Found out about the history of my city or community.
35	35	35	40. Found out about the way some government agency (post office, court, police, etc.) operates.
21	19	21	41. Wrote a letter to someone in another country.
17	18	14	42. Made a map of my community.
11	10	9	43. Organized or helped organize paper drive, rummage sale, etc.
17	13	15	44. Designed stage settings for a play or skit.

THINGS DONE ON YOUR OWN (continued)

	Per Cent Checking			
Total Sample	High Ability Group	High Capability for Independent Study Group		
65	61	62	45.	Took black and white photographs.
15	20	20	46.	Made block prints or linoleum cuts.
38	31	39	47.	Made a toy for a child.
34	37	31	48.	Made wood or soap carvings.
26	29	29	49.	Drew up plans for an invention, apparatus, etc.
22	22	17	50.	Made up a recipe for some kind of food.
33	37	32	51.	Made a poster for some club, school, or other event.
52	54	44	52.	Drew cartoons.
27	30	26	53.	Illustrated a story.

APPENDIX J

FLYER FOR MAIL-IN KITS

Dear Student:

A limited amount of free material is available for students participating in the Illinois Project in enrichment television. This material is designed to provide information and entertainment related to the television lessons or to follow up your own personal interests. Each kit is intended strictly for your enjoyment.

The following four kits are available, but only one of the four kits can be sent to any one person.

1. Space flight information. This kit contains seven pamphlets prepared by the National Aeronautics and Space Administration (NASA) discussing and illustrating: (1) orbiting observatories - solar (OSO), astronomical (OAO) and geophysical (OGO); (2) Pioneer V and Mariner projects; and (3) Space: the New Frontier. This last is a richly illustrated booklet discussing the history of space flight, our solar system, and space exploration techniques.

2. Mathematics puzzles. This kit contains a sample copy of the Mathematics Student Journal and several pages of mathematics games and puzzles. The puzzles may amuse and amaze you and are intended for fun and enjoyment based on various mathematical principles.

3. Star finder. This kit contains several constellation cards to use with a star or constellation recognition box and instructions for making the star finder out of a cardboard box. By punching small holes in the cards and holding the box up to the light, you can see pin points of light as the stars appear in the night sky. Each constellation card includes a brief description of the constellation.

4. Peg board set. This kit contains the material needed, except for the wooden base, to make a peg board grid for use in mathematical problems of area, geometry, and topology. You must provide the wooden base which should be a piece of board or plywood 1/2 inch or more thick and 6" x 8" or larger. Included in the kit are directions, nails, rubber bands, and some problem pages.

If you would like to receive one of these kits, free, just fill out the form below and either mail it directly to the University of Illinois, or hand the form to your teacher who will see that it is sent in.

APPENDIX K

OCCUPATIONAL STATUS CODE USED IN STUDY

(Based on Edwards' Occupational Index and Warner's work)

0. UNEMPLOYED

1. UNSKILLED LABOR - carpenter assistants, watchmen, gas station attendants, waitresses, tenant farmers on small farms, heavy laborers, construction laborers, migrant laborers, janitors, kitchen helpers.

2. SEMI-SKILLED LABOR AND SIMPLE CLERICAL - store clerks, beauty operators, simple machine operators, telephone servicemen, firemen, police patrolmen, practical nurses, farm workers on large farms with complex machinery, truck drivers, bartenders.

3. SKILLED LABOR AND COMPLEX CLERICAL - skilled trade union occupations such as electricians, carpenters, butchers, plumbers, etc.; stenographers, pool secretaries, sheriffs, police sargeants, small and medium farm operators/owners (50-250 acres), bookkeepers, factory supervisors over unskilled and semi-skilled labor, mechanics, printers, pressmen, welders, sheet steel workers, linemen, jewelers.

4. MINOR PROFESSIONAL, BUSINESS AND MANAGERIAL - bank clerks, cashiers in responsible positions (dime store or restaurant cashiers who do not keep books should be in 3), private secretaries, contractors (unless a very large organization), small firm owners/operators (1-5 person operation), social workers, optometrists, salesmen and manufacturing representatives, auto dealers, real estate dealers, factory foremen over skilled labor, office managers, laboratory technicians, funeral directors, surveyors.

5. MEDIUM PROFESSIONAL - elementary and secondary school teachers, nurses, minor editors, department heads in businesses, assistant managers, CPA's, accountants, engineers, medium business firm owners/operators, large farm owners, stockbrokers, librarian, pharmacist.

6. PROFESSIONAL, MANAGERIAL - lawyers, doctors, school supervisors, principals, college faculty (Ph.D's and administration hierarchy), graduate ministers, regional managers of large firms, large business owners/operators, executives in large firms, hospital administrators, architects, dentists, judges, veterinarians.

APPENDIX L

COMMENTS ON A SUBSAMPLE OF AVERAGE TO BELOW-AVERAGE STUDENTS

During the winter months of the broadcast period, it came to the attention of the Project that a school with children from average to below-average educational backgrounds was using the telecasts and had viewed the Astronomy series without any Project Books. A single teacher from Gregory School in Champaign was bringing her eight-inch screen television set in from home and, with her six grade students and a few of the better fifth grade students from another class, was using the telecasts for enrichment of her curriculum.

After visiting the school and observing the interest of the students, the Project Director arranged to do some testing of the students during the Geography broadcast period. The objective of these evaluations was to see if teacher and student interest could overcome the inherent difficulty of material aimed at high-ability children. The average IQ score for the Gregory School sample, based on the California Test of Mental Maturity given in the fifth grade, was 100. A new television set was obtained and additional children added to the viewing group which was moved from the classroom into a multiple-purpose room. The same before and after tests were administered to these students as to the gifted viewing group.

Figure 4 indicates the Gregory School students' evaluation of the concept ASTRONOMY, in March, compared with the gifted viewing group's evaluations. While there were no "before-astronomy" measures available for the Gregory School group which would allow an estimate of attitude change, it is interesting to note that their evaluations after four months are generally more favorable than the gifted viewing group for which the lessons were intended. At the same time the teacher noted that the lessons were much too difficult for them and that the students had missed many of the concepts being presented.

Table 20 presents a variety of comparisons between the Gregory School sample and the Geography gifted viewing group. The mean scores for the high ability subsample are also shown for comparison. The Gregory School group and the gifted experimental group are clearly different in background characteristics. The gifted viewing group scored significantly higher on the geography achievement test than the Gregory School group. The Geography gifted non-viewing group also scored significantly higher on the geography test than the Gregory School group (21.42 to 18.96), although the differences are small enough to suggest that they would not be significant if differences in entering knowledge of social studies and geography were controlled for.

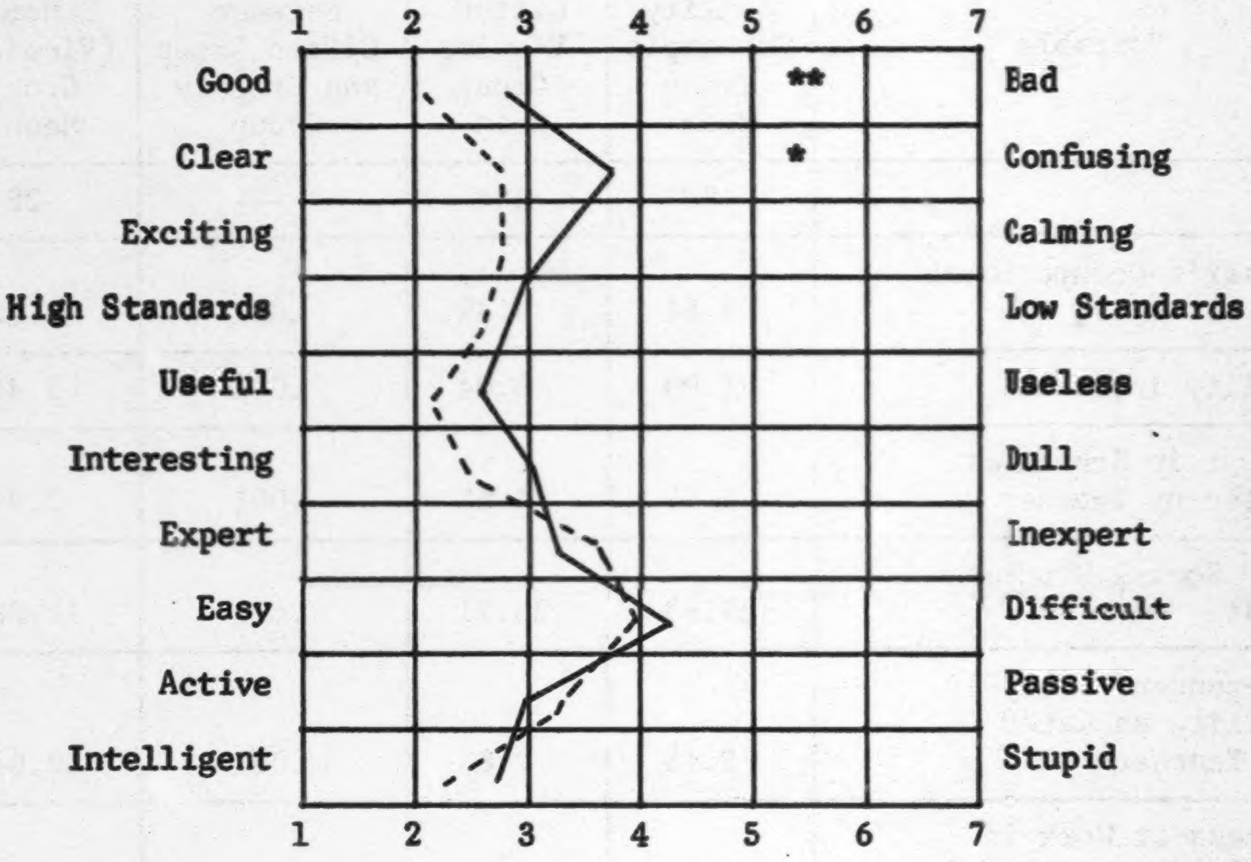
On the attitude and motivation measures, the gifted viewing group is generally more favorable than the Gregory School sample. Indeed, while the gifted viewing group tended to move toward more favorable attitudes during the series, the Gregory School group tended to have less favorable attitudes after the series. Figure 5 indicates the relative positions of the two groups on the concepts GEOGRAPHY and THE TELEVISION COURSE ON GEOGRAPHY after the end of the Geography series.

It is interesting to speculate as to why the Gregory School sample was relatively unfavorable toward the Geography series when they seemed to be relatively more favorable than the gifted viewing sample toward the Astronomy series. The Astronomy series was generally judged as more difficult than the Geography series. It is suggested that the difference is in the viewing situation. Instead of being a small group of friends huddled in front of a little TV screen doing something different and something no one else was doing, as during the Astronomy series, they had become a larger group lined up in rows with other classes joining them including some above-average fourth graders, watching a bigger screen in somebody else's space. The glamour was gone.

Even without learning a great deal, or without learning much of what was presented, the Gregory School students, with the careful motivating and follow-up of the classroom teacher, were able to remain interested and satisfied with the learning situation. These results emphasize the importance of the classroom teacher in preparing the students and the environment for a learning situation, particularly when the material is not closely suited to the ability level and capacity for self-directed study of the student. On the whole, however, the use of these lessons for students of average or below-average ability can not be recommended. More directly suited materials would undoubtedly be more effective.

Figure 4

Comparison of Mean Semantic Differential Item Scores on Concept ASTRONOMY for Astronomy Gifted Viewing Group and Gregory School Viewing Group



NOTE: Solid line indicates gifted viewing group; dashed line indicates Gregory School group.

* Indicates significant difference at .05 level.

** Indicates significant difference at .01 level.

Table 20

Comparison of Criterion Means for High Ability Group, Geography Experimental Group, and Gregory School Group

Variable		High Ability Subsample Group Mean	Geography Gifted Viewing Group Mean	Sig. of Dif. Between Gifted Group and Gregory Group	Gregory School (Viewing) Group Mean
N		89	404	---	25
Father's Occupational Level		4.64	4.42	.001	2.33
Ability Index		4.00	3.04	.001	1.46
Effort in School as Rated by Teacher		3.99	3.63	.001	2.92
STEP Social Studies Test		28.84	25.71	.001	17.23
Independent Study Ability as Rated by Teacher		3.15	2.85	.001	2.04
Success at Work in TV Project as Rated by Teacher		2.48	2.26	n.s.[a]	2.12
Number of Pages Worked on in Geography Workbook out of Five Checked		---	3.42	.01	2.59
Geography Test Score		26.72	23.86	.001	18.96
Rank of Subject Geography in Terms of Interest	Jan.	5.00	4.79	n.s.	3.83
			(n.s.)		(.02)[b]
	Mar.	5.33	4.98	n.s.	5.81
Attitude Scale Score on Geography	Jan.	6.88	6.66	n.s.	6.68
			(n.s.)		(n.s.)
	Mar.	6.72	6.54	.02	5.72
Number of Social Studies Books Read in Last 30 Days		0.04	0.06	n.s.	0.04

Table 20 (Con't)

Variable		High Ability Subsample Group Mean	Geography Gifted Viewing Group Mean	Sig. of Dif. Between Gifted Group and Gregory Group	Gregory School (Viewing) Group Mean
Semantic Differential Evaluation on Good-Bad Scale on Concept GEOGRAPHY	Jan.	2.06	2.33	n.s.	1.96
			(.001)		(n.s.)
	Mar.	2.01	1.98	.01	2.77
Semantic Differential Evaluation on Interesting-Dull Scale on GEOGRAPHY	Jan.	2.25	2.41	n.s.	1.75
			(n.s.)		(n.s.)
	Mar.	2.68	2.48	n.s.	2.23
Semantic Differential Evaluation on Easy-Difficult Scale on GEOGRAPHY	Jan.	2.75	3.17	.02	4.00
			(.001)		(n.s.)
	Mar.	2.71	2.71	.01	3.73
Good-Bad Scale on THE TV COURSE ON GEOGRAPHY		---	2.21	n.s.	2.44
Interesting-Dull Scale on THE TV COURSE ON GEOGRAPHY		---	2.67	n.s.	2.17
Easy-Difficult Scale on THE TV COURSE ON GEOGRAPHY		---	2.77	.02	3.65

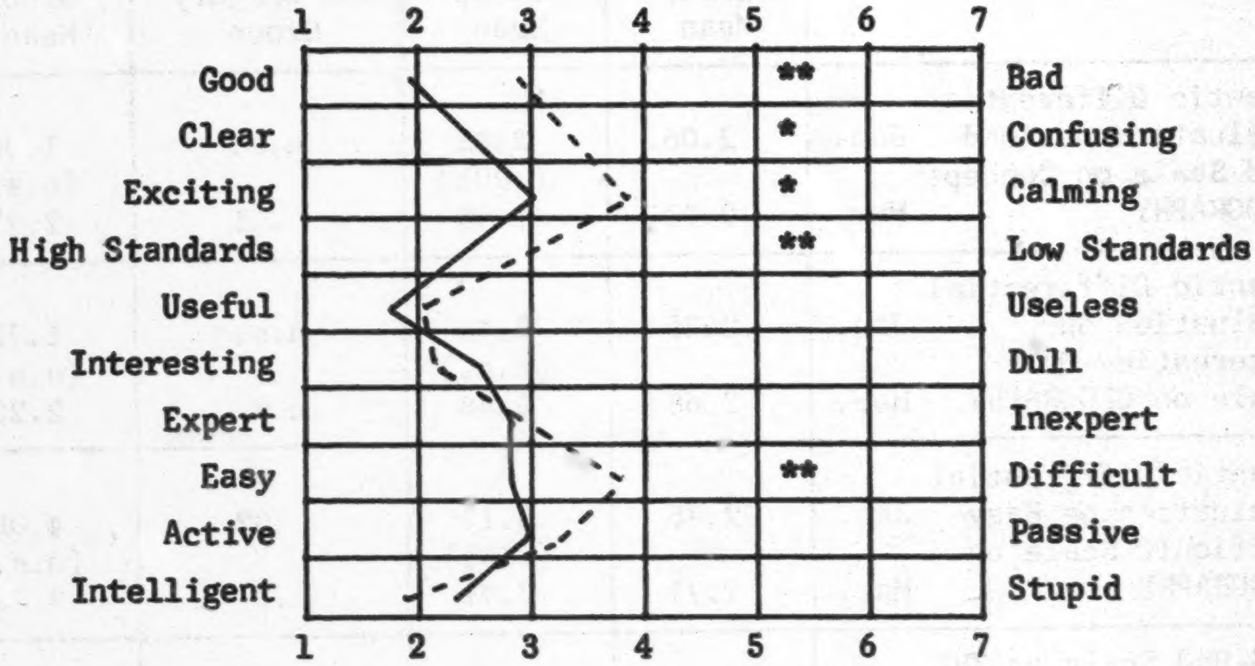
[a] n.s. stands for not significant.

[b] Numbers or letters between January means and March means indicate significance of difference between January and March scores for that group.

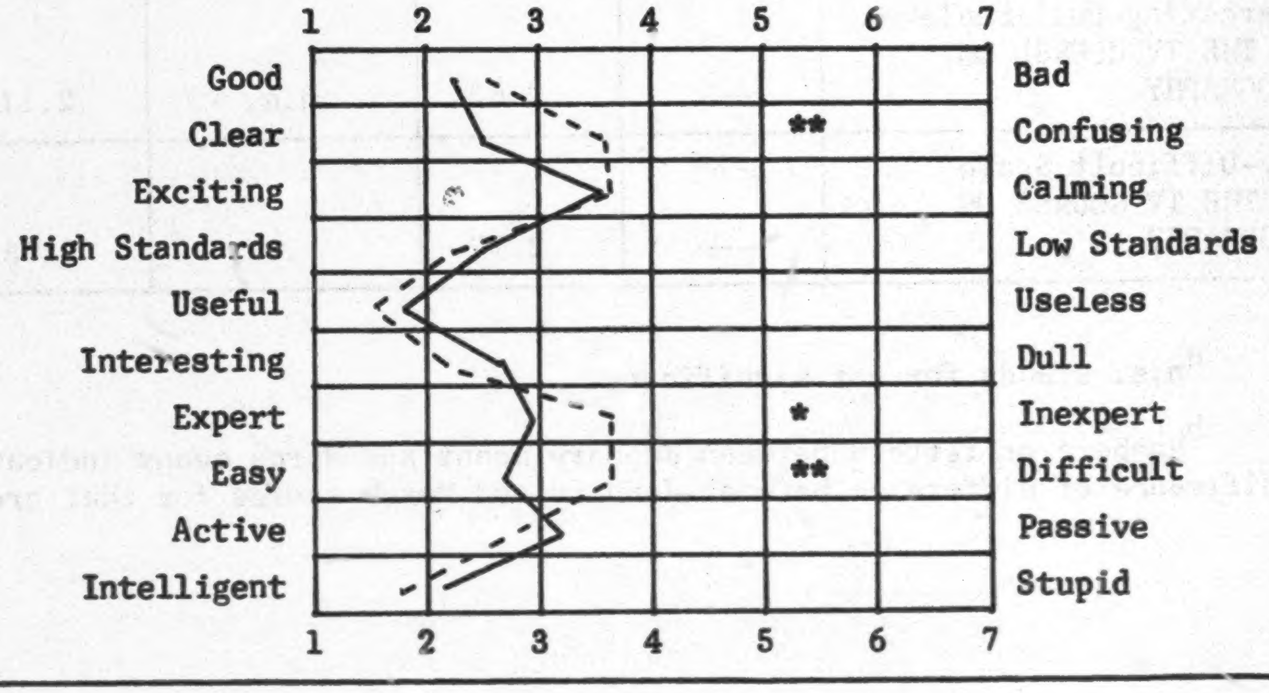
Figure 5

Comparison of Gifted Viewing Group and Gregory School Viewing Group on Two Concepts

GEOGRAPHY



THE TV COURSE ON GEOGRAPHY



NOTE: Solid line indicates gifted viewing group (N = 398); dashed line indicates Gregory School viewing group (N = 22).

*Indicates difference is significant at the .05 level.

**Indicates difference is significant at the .01 level.

APPENDIX M

TECHNICAL APPENDIX AND ADDITIONAL TABLES

The statistical results reported in Chapter 4 are based on various multivariate analysis methods. Tables of per cents, chi squares, and correlations should not cause the reader any difficulty in interpretation. Some of the terms used in the tables displaying analysis of covariance results may be unfamiliar to the reader, and are explained below.

In analysis of covariance the effect, or influence, of some control variable (covariate) is removed (partialled out, adjusted for) before a comparison of means is made. For example, the effect of differences in IQ scores among students is controlled. One then asks, after the effect of the control variable is removed, if there remains a significant difference between the mean criterion score for one group compared with the mean criterion score for another group. The original or unadjusted mean score has been adjusted for the effect of the control variable. It is the difference between these adjusted means that is tested for significance.

In multiple regression analysis, the adjustment made to the original score is called a "b weight" or "beta weight." A beta weight applies to continuous variables - variables that can have many different values such as IQ or age. In analysis of covariance the adjustment is made to discontinuous variables - variables that can have only a few values such as sex or experimental versus control groups. The adjustment made with discontinuous variables is commonly called the "effect." An F ratio is used to test whether a group of "effects" are significantly different from one another, for example whether those who answer "agree," "neutral," or "disagree" have different criterion means. To test whether two "effects" are different from each other, for example, whether the experimental and control groups differ from each other, a "t" test may be used. The size of the F or t plus the number of persons involved indicates the significance of the differences. The significance test is made on the adjusted values for the particular criterion.

The significance tests reported in Chapter 4 were all two-tailed testing whether there were significant differences in the expected direction or in the opposite direction. The tests for differences in attitude and achievement could properly have been one-tailed tests since the hypotheses predicted a direction of difference. For uniformity on reporting the various tables, however, the two-tailed tests were used throughout. Interpretation of the results using one-tailed or directional tests would not change the meaning or sense of any of the findings.

The following tables, Tables 21, 22, 23, and 24, are referred to in Chapter 4.

Table No. 21

Summary of Significance of Differences Between Viewers and Non-Viewers on Selected Control Variables for Each Series

Variable	Astronomy	Mathematics	Geography
IQ	n. s.[a]	n. s.	n. s.
STEP science	p = .05 control group lower	—	—
STEP mathematics	—	n. s.	—
STEP social studies	—	—	n. s.
Age	n. s.	n. s.	n. s.
Sex	n. s.	n. s.	n. s.
Grade level	n. s.	n. s.	n. s.
Rural-urban school	p = .12 control more urban	n. s.	p = .001 control more rural
Socio-economic status of school	p = .001 control higher	p = .001 control higher	p = .001 control lower
Father's occupation level	p = .001 control higher	n. s.	p = .001 control lower
Father's educational level	p = .005 control higher	n. s.	p = .001 control lower
Mother's educational level	p = .025 control higher	n. s.	p = .001 control lower
Academic motivation	n. s.	n. s.	n. s.

[a] n.s. stands for not significant.

Table 22

Correlations Among Attitude Measures on Astronomy Series

Variables		1	2	3	4	5	6	7	8	9	10	11	12
IQ	1	--	.29	.15	.00	-.05	.07	.08	.07	.03	.07	.04	.03
STEP Science Test	2		--	.44	.06	.00	.21	.23	.12	.15	.12	.08	.10
Astronomy Test	3			--	.06	.08	.09	.08	.14	.10	.12	.04	.07
No. Science Books Read	4				--	.56	.18	.27	.08	.08	.09	.11	.11
No. Astronomy Books Read . . .	5					--	.09	.11	.01	.03	.06	.10	.10
Science Attitude Scale	6						--	.48	.34	.50	.33	.25	.32
Science Activity Index	7							--	.23	.29	.37	.26	.36
Science Ranked for Usefulness .	8								--	.49	.15	.18	.13
Science Ranked for Interest . .	9									--	.16	.19	.18
Astronomy - Bad-Good	10										--	.60	.67
Astronomy - Calming-Exciting .	11											--	.66
Astronomy - Dull-Interesting .	12												

(N = 454)

NOTE: All scores have been adjusted so that the high score is the favorable attitude end. The shaded correlations indicate significance at the .05 level. Correlations of .16 are significant at the .001 level.

Table 23

Correlations Among Attitude Measures on Mathematics Series

Variables		1	2	3	4	5	6	7	8	9	10
IQ	1	--	.33	.34	.03	.09	.12	.11	.01	.10	.10
STEP Mathematics Test	2		--	.44	.03	.12	.18	.14	.06	.09	.07
Mathematics Test	3			--	.08	.16	.11	.12	.11	.09	.10
Number of Mathematics Books Read . .	4				--	.08	.00	.04	.07	.04	.06
Mathematics Attitude Scale	5					--	.29	.52	.58	.54	.65
Mathematics Ranked for Usefulness . .	6						--	.36	.26	.24	.26
Mathematics Ranked for Interest . . .	7		(N = 453)					--	.42	.37	.40
Mathematics - Bad-Good	8								--	.61	.69
Mathematics - Calming-Exciting . . .	9									--	.67
Mathematics - Dull-Interesting . . .	10										--

NOTE: All scores have been adjusted so that the high score is the favorable attitude end. The shaded correlations indicate significance at the .05 level. Correlations of .16 are significant at the .001 level.

Table 24

Correlations Among Attitude Measures on Geography Series

Variable	1	2	3	4	5	6	7	8	9	10
IQ 1	--	.30	.44	-.07	.00	.00	-.03	.07	-.01	.03
STEP Social Studies Test 2		--	.44	-.04	-.03	-.03	-.02	.03	-.02	.06
Geography Test 3			--	.00	.00	-.06	.02	.09	.01	.00
Number of Social Studies Books Read . . 4				--	.16	.18	.13	.08	.08	.09
Geography Attitude Scale 5					--	.39	.60	.58	.50	.60
Geography Rank for Usefulness 6						--	.48	.29	.25	.30
Geography Ranked for Interest 7		(N = 452)					--	.46	.36	.39
Geography - Bad-Good 8								--	.56	.59
Geography - Calming-Exciting 9									--	.62
Geography - Dull-Interesting 10										--

NOTE: All scores have been adjusted so that the high score is the favorable attitude end. The shaded correlations indicate significance at the .05 level. Correlations of .16 are significant at the .001 level.

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